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Table of Contents.

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ORIGINAL ARTICLES— Page.
- The Diagnosis and Treatment of Acute Abdominal Conditions in Children, by P. L. Hipsley, M.D., Ch.M., F.R.A.C.S. .. 651
- The Results of Intranasal Inoculation of Modified and Unmodified Influenza Virus Strains in Human Volunteers, by F. M. Burnet and M. Foley .. 655
- Some Associations of the Old Hobart General Hospital, by W. E. L. H. Crowther .. 659
- The Effect of Exercise in Hot Atmospheres upon the Pulse Rate, by Douglas H. K. Lee, M.Sc., M.D., B.S., D.T.M., and G. P. B. Boissard, B.Sc. 664
- A Destructive Skin Disease of the Face in Natives of Papua and North Australia, by Edward Ford 668

REPORTS OF CASES—
- Gall-Stones in a Boy Aged Eleven Years, by V. M. Coppleson .. 669
- Cæsarean Section for Pelvic Deformity. Puerperal Eclampsia, by Mary C. De Garis .. 669

REVIEWS—
- The Medical Sciences and Public Health in Germany 670
- Surface Anatomy .. 670

LEADING ARTICLES—
- Contusion of the Heart .. 671

CURRENT COMMENT—
- Fœtal Activity and Nutrition .. 672
- Public Acceptance of Facilities for the Diagnosis of Tuberculosis .. 673
- War Savings Certificates: An Appeal .. 673

ABSTRACTS FROM MEDICAL LITERATURE— Page.
- Medicine .. 674
- Surgery .. 675

SPECIAL ARTICLES ON PSYCHIATRY IN GENERAL PRACTICE—
- On Therapeutic Judgement and Allied Problems .. 676

BRITISH MEDICAL ASSOCIATION NEWS—
- Scientific .. 677

MEDICAL SOCIETIES—
- Melbourne Pædiatric Society .. 679

CORRESPONDENCE—
- A Medical Economic Problem .. 681
- An Appeal .. 682
- Uncommon Tapeworm in a Child (Dipylidium Caninum) .. 682

NOTICE .. 682

OBITUARY—
- John Johnston .. 682
- John Joseph O'Neill .. 682
- Florence Charles Burke-Gaffney .. 682

DIARY FOR THE MONTH .. 682

MEDICAL APPOINTMENTS: IMPORTANT NOTICE .. 682

EDITORIAL NOTICES .. 682

THE DIAGNOSIS AND TREATMENT OF ACUTE ABDOMINAL CONDITIONS IN CHILDREN.[1]

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THE cases which come into the category of acute abdominal conditions are those in which there exists an acute condition of some portion of one or other of the abdominal or pelvic viscera, due to inflammation, strangulation, obstruction or perforation. Such conditions are the following: acute appendicitis, pneumococcal peritonitis, volvulus, acute intussusception, intestinal obstruction due to strangulation by bands, acute cholecystitis and gall-stones, perforated duodenal and gastric ulcers, torsion of ovarian cysts or of tube and ovary, and inflammation or perforation of a Meckel's diverticulum. The principal symptom of all these conditions is abdominal pain. In most of them vomiting and an increase in the pulse rate occur, and in the inflammations pyrexia is present. In the perforations, strangulations and obstructions, at first the temperature will be subnormal. As pain is a subjective symptom, its degree of severity is much more difficult to assess, and its location more difficult to define, in children than in adults; and the failure of the clinician to make a correct diagnosis in these cases is frequently due to his failure to make a sufficiently thorough examination, possibly owing to his not having gained the child's confidence before attempting a diagnosis. When a child is in pain, the examination has frequently to be made in an antagonistic atmosphere, and so diagnosis is often much more difficult in children than in adults. The mortality rate in these conditions is still far too high, owing rather to faulty diagnosis than to improper treatment. It is the doctor who sees these patients in the first instance who has to shoulder the greatest responsibility, because the early diagnosis rests with him, and failure to make a correct diagnosis early greatly minimizes the chances of recovery. Before attempting to make a diagnosis of an acute abdominal condition in a child, one must be prepared to spend a considerable amount of time, first in getting an accurate history of the complaint from the mother or guardian, and secondly in gaining the confidence of the child. Five minutes spent in observation of the attitude, facies and general behaviour of the child, may give you more help in diagnosis than a prolonged physical examination. I could recount numerous instances in which faulty diagnosis was due to failure to listen carefully to the history of the illness as recounted by the mother, followed by an attempt to make a diagnosis by a hasty physical examination.

In spite of what is sometimes said about fond mothers being over-anxious and neurotic, there is no more reliable observer of the slightest departure from sound health of her child, and no one who is more likely to recognize signs and symptoms indicative of serious illness, than an intelligent mother. Fewer mistakes would be made in the diagnosis of acute abdominal conditions if the doctor realized this fact.

Appendicitis.

Appendicitis is by far the most frequent cause of abdominal pain in children (Table I). Failure to make a correct diagnosis may be due to the difficulty of making a thorough physical examination of a young nervous child in severe pain. The frequency of appendicitis in young children is not sufficiently realized by either doctors or lay people. For a young child to have "stomach ache" occa-

[1] Read at a meeting of the New South Wales Branch of the British Medical Association on October 31, 1940.

sionally, is unfortunately frequently regarded as more or less normal and of no consequence. Repeated attacks of abdominal pain in children will nearly always be found to be due to repeated attacks of appendicitis, although it may be very difficult to demonstrate the usual physical signs of this complaint. Since most of the attacks are associated with vomiting, and since vomiting from any cause is so often associated with acetonuria, the attacks are often diagnosed as cyclical vomiting. One sees far too many cases in young children in which the appendix has been ruptured for several days before a correct diagnosis is made. It has been my experience that a gangrenous appendix, situated deep down in the pelvis, is seldom diagnosed under six or seven days; and so a pelvic abscess has frequently developed before the true nature of the complaint is recognized. When the inflamed appendix is adherent to the rectum, the children pass much mucus with little fæces at frequent intervals, and so the pain is attributed to enteritis or colitis, and the all-important rectal examination is omitted. The complete absence of abdominal muscular rigidity in these cases is another feature which leads to delay in diagnosis. When the appendix is situated in other abnormal positions, as for example when malrotation of the bowel is present, mistakes in diagnosis are not so common, because muscular rigidity and tenderness are always present over some portion of the anterior abdominal wall. When the caecum has not descended, the differential diagnosis between appendicitis and cholecystitis would be difficult if it were not for the rarity of the latter complaint in young children. Although the pain in even a perforated appendix is seldom as severe as in renal or biliary colic, yet it may be excruciating and cases are not infrequently encountered in which a diseased appendix has caused recurrent attacks of agonizing pain, impossible to distinguish from renal colic without a careful urological investigation. The opposite condition of mistaking renal colic for appendicitis should not occur if the urine is examined microscopically for red cells and pus cells; it must be remembered, however, that the presence of these does not definitely exclude appendicitis.

TABLE I.

Showing Number of Cases of Appendicitis and the Mortality Rate at the Royal Alexandra Hospital for Children in a Ten-year Period.

Year.	Number of Deaths.	Total Cases (Including Deaths).	Rate of Mortality. (Percentage.)
July, 1930, to June, 1931	6	263	2·2
July, 1931, to June, 1932	7	273	2·5
July, 1932, to June, 1933	8	302	2·6
July, 1933, to June, 1934	3	296	1·01
July, 1934, to June, 1935	5	379	1·3
July, 1935, to June, 1936	7	403	1·7
July, 1936, to June, 1937	7	323	2·1
July, 1937, to June, 1938	8	356	2·2
July, 1938, to June, 1939	6	312	1·9
July, 1939, to June, 1940	3	345	0·8
Totals	60	3,252	1·8

In the Royal Alexandra Hospital for Children, during the ten-year period between July, 1930, and July, 1940, 3,252 patients were operated on for appendicitis; the condition was not in all cases acute at the time of operation, and probably the diagnosis was not always correct, but in all cases the diagnosis of appendicitis was made and operation was performed. There were 60 deaths—a mortality rate of a little over 1·8%.

Treatment.

Whatever be the case in adults, I am of the opinion that the Ochsner-Scherren treatment has no place in children. It may be safe to delay an operation, but such a procedure is a gamble, and once one is sure or feels reasonably certain of the diagnosis, whether on the first or on any subsequent day, the condition of the appendix should be investigated by operation, as the more experience one gains, the less sure one is of the actual condition of the appendix. The decision as to whether the appendix is to be removed or whether its removal can be more safely deferred to a subsequent operation (after any abscess forming has been well shut off) should be made after investigation of the state of affairs through an incision. If the appendix is gangrenous without free pus, it should be removed wherever it is, and the incision should be long enough to ensure its removal without rupture and consequent fouling of the peritoneum. If the slightest leakage of pus has occurred, a drain should be inserted. Many lives are still lost owing to that foolish advice given by some wiseacre in the past: "When in doubt, don't drain." A drain of the right material, such as a strip of rubber glove, correctly placed—that is, as far away from the middle line as is consistent with satisfactory drainage—has never done any harm even when it was unnecessary; and when there is any trace of pus a drain is absolutely essential.

Pneumococcal Peritonitis.

During the ten-year period between February, 1930, and February, 1940, 20 children suffering from pneumococcal peritonitis were admitted to the Royal Alexandra Hospital for Children, and in six of these cases nephrosis was associated, so that the lesion could hardly be mistaken for an acute abdominal condition. Of the remaining 14 patients three had pneumonia, and so the peritonitis was only one lesion in a patient suffering from general pneumococcal infection. The other 11 patients had general peritonitis, which would be very difficult, if not impossible, to distinguish from general peritonitis caused by a ruptured appendix—and indeed, in most of the cases such a diagnosis had been made before operation. There were, however, several features which might have assisted in the making of a correct diagnosis. The illness generally commenced with abdominal pain and vomiting; but the pain was never so severe as one expects to find from a ruptured appendix. Diarrhœa and frequency of micturition were common accompanying signs. Even when the peritonitis had been present for several days before operation, the children did not look so ill, and were not suffering from such a severe degree of toxæmia, as one finds when general peritonitis from *Bacillus coli communis* infection is present. There is no doubt that peritoneal puncture and examination of the peritoneal exudate would decide the diagnosis; but this procedure was not followed in any of these cases. In two cases so little fluid was encountered at operation that peritoneal puncture would have been difficult and possibly dangerous. In the three cases in which pneumonia was present, the most likely diagnosis would be pneumococcal peritonitis, although a ruptured appendix could not be excluded. The cases in which pneumococcal peritonitis complicated nephrosis are interesting, and no satisfactory explanation appears to have been offered as to the relationship between these two conditions.

In these six cases five of the patients were males and one was a female; two were aged four years, one was aged six years, two were aged ten years and one was aged seven years. Four of these died—a mortality rate of over 66%. In the 14 other cases, three of the patients were males and 11 were females; their ages ranged from thirteen months to eleven years. Five of these died—a mortality rate of over 35%.

Treatment.

All the patients who recovered were operated on; the appendix was examined through a muscle-splitting incision, and drainage was then instituted. Since the introduction of sulphapyridine ("M & B 693"), it is clear that this drug should be used in all cases, and if the diagnosis of pneumococcal peritonitis is established, then operation should be delayed, and aspiration of as much pus as possible should be practised, until the full benefit of the drug has been obtained. I believe that if this method is followed, in some cases the condition should clear up without operation; and in others the greater part of the generalized infection will disappear, and simple drainage of any residual abscess will be all that is likely to be necessary.

The only patient in the above series who was treated in this way was one who had nephrosis in association with pneumococcal peritonitis.

R.W., a male, aged ten years, had been in hospital about twelve months previously for nephrosis. On his readmission to hospital he had generalized œdema and pronounced albuminuria. Five pints of thin pus were aspirated from the abdomen and the pneumococcus was grown on culture. He was given anti-pneumococcal serum and full doses of sulphapyridine. More pus was aspirated on several occasions during the next four or five weeks. The pus gradually became thicker and more localized. Finally an incision was made in the left iliac region, about a pint of pus was evacuated, and a drainage tube was inserted. The tube was removed after a few weeks and the wound thereupon completely healed. The œdema and albuminuria completely disappeared, and the child is now perfectly normal in every way.

Barnett, Hartmann, Perley and Ruhoff[10] describe two cases of pneumococcal peritonitis, in which recovery occurred after the use of sulphapyridine. One patient was a child, aged six years, with nephrosis, whose case was similar to that just described, and the other was a child, aged ten years, whose symptoms resembled those of peritonitis from a ruptured appendix.

I believe that the appendix should not be removed in cases in which the abdomen has been opened for confirmation of the diagnosis, owing to the danger of adding a *Bacillus coli communis* infection to the pneumococcal infection. If, therefore, the diagnosis can be made by peritoneal puncture, and if treatment by sulphapyridine can be instituted early, the mortality rate in these cases should be considerably reduced.

Intussusception.

Intussusception nearly always occurs in exceptionally healthy infants (Table II). The symptoms in the great majority of cases are typical. They are sudden in onset, with screaming and pallor, and after a few hours some blood and mucus are passed *per rectum*. Between attacks the child is pale and listless. The mother is not usually greatly alarmed until blood is passed, and this sends her off to the doctor. All these signs and symptoms will invariably be recounted by an intelligent mother, and it behoves the doctor to listen carefully to the mother's account of the illness of her child, as the diagnosis can usually be made on this alone and confirmed by the feeling of a mass in the abdomen. Mistakes are sometimes made because of the failure to palpate a tumour, which is always there to be felt, but may be missed, either because of lack of experience, or because of rigidity of the abdominal muscles of a frightened and screaming child. When the symptoms are typical the child should be thoroughly investigated, if necessary under anæsthesia, because any delay in treatment is fraught with grave consequences. Atypical cases occur which may cause more difficulty in diagnosis.

TABLE II.

Showing Number of Cases of Intussusception and the Mortality Rate at the Royal Alexandra Hospital for Children in a Ten-year Period.

Year.	Number of Deaths.	Total Cases (Including Deaths).	Rate of Mortality. (Percentage.)
July, 1930, to June, 1931	3	48	6·2
July, 1931, to June, 1932	4	37	10·8
July, 1932, to June, 1933	2	30	6·6
July, 1933, to June, 1934	7	30	23·3
July, 1934, to June, 1935	6	40	15·0
July, 1935, to June, 1936	2	27	7·4
July, 1936, to June, 1937	6	30	20·0
July, 1937, to June, 1938	3	40	7·5
July, 1938, to June, 1939	2	35	5·7
July, 1939, to June, 1940	2	48	4·1
Totals	37	365	10·1

1. Spontaneous reduction may occur. The symptoms are typical, but on investigation, possibly under anæsthesia, no mass is palpable, either because spontaneous reduction has occurred or because reduction has been effected by the giving of an enema or by manipulation during palpation. I have encountered cases in which this has happened on several occasions over the course of three weeks.

2. Strangulation of the intussusception may not occur for several weeks, and some fæces and gas may pass through the partially obstructed bowel. This is due to the presence of a long mesocolon. These infants rapidly lose weight, and a diagnosis of gastro-enteritis is apt to be made. After a time the intussusception may project through the anus, and the condition may be diagnosed as prolapse of the bowel.

3. Blood does not always appear *per rectum*, even when the intussusception is of the enteric or ileo-colic variety.

4. In intussusception of the appendix the symptoms are of a more chronic nature. There is an entire absence of shock, which is so characteristic of the acute cases. These cases generally occur in older children, blood is generally absent from the stools and a tumour can be palpated in the right iliac region.

The signs and symptoms of acute intestinal obstruction, such as incessant vomiting and distension of the abdomen, are usually absent for a considerable time in most cases of intussusception. The abdomen for the first twenty-four hours may be soft and flaccid, and it is this fact which enables the tumour to be so easily palpated, and which helps so much in the diagnosis of reduction when hydrostatic pressure has been used, as after successful reduction by this means the abdomen becomes distended.

Treatment.

In the ten-year period between July, 1930, and July, 1940, 365 patients suffering from intussusception were treated at the Royal Alexandra Hospital for Children, and 37 of the children died—a mortality rate of a little over 10%. Some years ago, after investigating another series of 486 patients who had been treated at the same hospital by ten different surgeons, I found that the mortality rate was 11%. In a series of 210 cases of my own the mortality rate was 6·6%, and I attribute the difference mainly to the systematic use of hydrostatic pressure in effecting reduction. The morbidity rate must also be lower when reduction is effected without operation, since the opening of the abdomen of an infant must in many cases be followed by the formation of adhesions. I have encountered several cases in which such adhesions have caused intestinal obstruction in later childhood. In the more common or acute variety, reduction can be effected in 60% of all cases by the use of hydrostatic pressure, and in at least 40% of all cases one can be sure that reduction has occurred by observing certain easily recognizable signs. This, therefore, should be the method of choice, and operation should be resorted to only when injection fails, when one is not certain that reduction has been effected, and in all cases in which there has been a recurrence. When the intussusception has been present for several days, and the infant is dehydrated and toxæmic, it is essential to spend several hours in restoring the fluid balance and lost chlorides by the administration of saline and glucose solution intravenously before operation is resorted to.

Long duration of the condition *per se* is not a contra-indication to reduction by hydrostatic pressure, because in some cases in which the condition has been in existence for several weeks, it will readily yield to injection, whilst in others in which it has been in existence only for as many hours it will not respond. The ileo-colic variety will yield to injection in the early stages as readily as the other varieties. The retrograde variety, which is exceedingly rare, is the only variety which will not yield, at least to some extent, to treatment by injection.

I shall not attempt to describe in detail the method of reduction by hydrostatic pressure, as I have discussed this method on several previous occasions.[10] The pressure to be used must not exceed that of a column of water three feet six inches high. The diagnosis of complete reduction is based on the fact that after the injection the abdomen, which was previously soft and flaccid, becomes distended and remains so, even after the colon has been emptied.

This is due to some of the fluid having passed on into the small bowel. When this has occurred, no mass or thickened bowel can possibly be palpated, owing to the distension. When one can still feel a mass after attempting reduction by this means, the intussusception may have been reduced, and the mass felt is then due to the thickened and œdematous bowel which has been involved in the trouble. As it is impossible to distinguish between a small unreduced intussusception and the thickened bowel of a reduced intussusception, it is necessary to make a small grid-iron incision so as to determine which condition is present.

When the intussusception is irreducible, excision of the mass and lateral anastomosis are the correct treatment, if the child will stand it. If not, the unreduced portion can be brought outside the abdomen and the abdominal wall closed around it. Duodenal aspiration should then be instituted, and the child should be given saline solution by the continuous intravenous drip method. If the child survives, the mass can be excised several days later, and the temporary colostomy or ileostomy can be dealt with later on.

Acute Cholecystitis and Cholelithiasis.

Acute cholecystitis and cholelithiasis are rare causes of acute abdominal pain in children. Only three cases of cholecystitis occurred at the Royal Alexandra Hospital for Children during the last ten years. Two patients were girls, one aged nine and the other aged eleven years. They both had symptoms and signs of cholecystitis, but no positive evidence of gall-stones. The other patient was a girl, aged ten years, who had had her appendix removed previously, but owing to a recurrence of the pain an X-ray examination was made, which revealed that she had a fairly large gall-stone in her gall-bladder.

A few months ago I saw another child, who was referred to me by Dr. Baillie-Newton. This was a boy, aged seven years. He was rather thin and was said to dislike fats. He had had several attacks of severe abdominal pain associated with vomiting. The attacks occurred mostly at night. The last attack was more severe and continuous, and he was vomiting frequently. Tenderness was most pronounced over the gall-bladder region. His temperature was 99° F. and his pulse rate 120 per minute. The trouble was at first thought to be due to acute inflammation of an appendix, the caecum not having descended. When the patient was under the anæsthetic, however, the distended gall-bladder could be seen moving with respiration. The gall-bladder was tensely distended, owing to a soft pigmented stone about the size of a large pea, which was impacted in the cystic duct.

Ovarian Cysts with Twisted Pedicle: Torsion of Tube and Ovary.

In girls suffering from acute lower abdominal pain, one must be on the alert for torsion of the tube and ovary, and for twisted ovarian cysts. I have had under my care during the last ten years three patients, each with one of these conditions.

The first was a girl, aged six years, who had had severe abdominal pain and vomiting for three days. A diagnosis of acute appendicitis was made, and at operation she was found to have a torsion of an otherwise normal tube and ovary. They were becoming gangrenous and had to be removed.

The second patient was a girl, aged thirteen years, who had symptoms resembling acute appendicitis; a diagnosis of acute appendicitis was made. At operation the appendix was found to be normal, and a further search for the trouble revealed a cyst, about three inches in diameter, in the right side of the pelvis, and becoming gangrenous owing to a twisted pedicle. This was excised through a separate incision.

The third patient's condition was very similar to the last, but the diagnosis was made before operation after rectal examination. The girl was also aged thirteen years, and the cyst proved to be parovarian instead of an ovarian cyst. It was also becoming gangrenous and had to be excised.

A rectal examination should always be made before operation on young girls with symptoms of appendicitis.

Meckel's Diverticulum and Acute Abdominal Pain.

A Meckel's diverticulum may cause acute abdominal pain in several ways.

1. When it is long and narrow, it may become inflamed and gangrenous and produce symptoms indistinguishable from appendicitis.

2. It may be the starting-point of an intussusception.

3. In some cases of acute inflammation the trouble starts in an area of mucosa resembling the acid-secreting mucosa of the stomach. Ulceration followed by perforation may occur as in jejunal ulcer, and sometimes repeated attacks of hæmorrhage precede the perforation.

4. The diverticulum, owing to its distal end being attached to the mesentery or abdominal wall, forms a loop, through which a portion of small bowel may become strangulated.

A case of this kind occurred recently at the Royal Alexandra Hospital for Children; the patient was a baby, aged six weeks. He had been vomiting for two days and showed signs of severe abdominal pain. He died within twenty-four hours of admission to hospital. *Post mortem* it was found that several inches of ileum had become strangulated, owing to their passage through a loop formed by the distal end of a Meckel's diverticulum, which had become attached to the mesentery.

Mesenteric Cysts and Acute Abdominal Pain.

Amongst the rarer causes of acute abdominal pain is intestinal obstruction due to an enlarging mesenteric cyst. Developmental cysts and diverticula are occasionally met with along the course of the intestinal tract in young infants and children. The cysts may project into the lumen of the bowel or between the layers of the mesentery, and when they are large they may cause intestinal obstruction from pressure or from superimposed volvulus.

A boy, aged eight years, was recently admitted to the Royal Alexandra Hospital for Children with acute intestinal obstruction from this cause. The cyst was about the size of a large orange and contained chylous fluid. There was a large amount of similar fluid in the abdominal cavity. The child recovered after excision of the cyst together with several inches of the ileum. The cyst wall was found to be similar in structure to the intestinal tract.

Malrotation of the Bowel.

Malrotation of the mid-gut loop must always be considered in the differential diagnosis of acute abdominal pain in infants and children. This condition is generally associated with an abnormally narrow attachment of the mesentery and an abnormally long mesocolon, which predispose to volvulus, either of the whole of the mid-gut loop or of portion of the small bowel. I have encountered many of these cases in young infants in whom signs of acute intestinal obstruction developed soon after birth. Non-rotation of the mid-gut loop, when the whole of the large bowel is in the left half of the abdominal cavity and most of the small bowel in the right half, is one of the causes of recurrent attacks of abdominal pain and vomiting, which commences in infancy and frequently goes on to late childhood before being diagnosed. A volvulus superimposed on non-rotation, or on reversed rotation, may cause intestinal obstruction at any period of life. The diagnosis is made by X-ray examination and the treatment is by abdominal section. In non-rotation it is usually possible to free the misplaced portion of the large bowel and restore it to its normal position. In reversed rotation, a short-circuiting operation is usually necessary. I reported a case[3] of the former kind; the patient was a girl, aged nine years, who had had attacks of vomiting and pain since infancy. The duodenum was enormously dilated owing to adhesions between the misplaced caecum and the duodenojejunal flexure, causing partial obstruction at this situation. An operation to free the large bowel and restore it to its normal position was completely satisfactory.

Hernia as a Cause of Abdominal Pain.

Strangulation of inguinal hernia is rare, and most of the cases that I have encountered occurred in young infants. I had one recently in an infant ten days old.

Femoral hernia is rare in children, and I have never seen or read of a case in which strangulation had occurred.

I have encountered many cases of umbilical hernia in children who were also suffering from repeated attacks of abdominal pain, but in every case the pain was due to other causes, generally to appendicitis. I have never encountered a case in which an umbilical hernia has been the cause of abdominal pain.

Diaphragmatic Hernia.

There are several varieties of diaphragmatic hernia; but the one giving rise to attacks of abdominal pain and vomiting is that in which the stomach, or portion of it, periodically passes through the œsophageal hiatus. This condition must therefore always be suspected when there is a history of repeated attacks of upper abdominal pain associated with vomiting and dyspnœa.

Some time ago I saw and successfully treated a girl, whose attacks had commenced in early infancy, and the trouble was not diagnosed until she reached the age of nine years. I was able to close the enlarged œsophageal hiatus in this patient through an incision parallel to and about one inch below the left costal margin.

Gastric and Duodenal Ulcers in Infants and Children.

Peptic ulcer is very rare in children. The rarity has been attributed to the small amount of acid in the gastric secretions of children, and to the motility and rapid emptying of the stomach.

Recently two patients, one suffering from gastric and the other from duodenal ulcer, were admitted to the Royal Alexandra Hospital for Children. Both were girls, one aged three and a half, and the other aged seven years. The first child vomited a large amount of blood over a period of twenty-four hours, and died as the result of hæmorrhage, twenty-four hours after her admission to hospital. *Post mortem* a small ulcer was discovered in the pyloric region of the stomach. The second patient had several attacks of hæmatemesis, associated with severe abdominal pain, over a period of two years. A duodenal ulcer was revealed by X-ray examination and the child recovered after treatment by diet and alkalis.

Recently a baby, aged twenty-four hours, died after severe hæmatemesis at the Royal Hospital for Women, Paddington. The early age and the failure of response to treatment, proved that the lesion was not hæmorrhagic disease of the new-born. At post-mortem examination a tiny excavated ulcer was found in the pyloric region of the stomach.

Downes[4] reported a case of perforation of a duodenal ulcer in a child, aged three years; a diagnosis of acute appendicitis had been made. Koplik,[5] quoted by Lockwood, reported one case of peptic ulcer in 300,000 of diseases in children.

Holt[6] quotes four cases of duodenal ulcer in young infants, all on the posterior wall of the duodenum just below the pyloric ring; all were round, punched-out ulcers.

I believe that in many cases of duodenal ulceration in young infants, some other condition is present interfering with the proper functioning of the duodenum, such as duodenal ileus due to pressure of the superior mesenteric artery; this itself is due to the drag of the small bowel attached by a very narrow mesentery.

Conclusion.

Finally, before coming to a conclusion as to the diagnosis of an acute abdominal condition, we must always exclude painful conditions in other parts. We all know how easy it is to fall into the error of diagnosing appendicitis, when the real trouble is renal or ureteral colic. Pneumonia and diaphragmatic pleurisy are often diagnosed as acute appendicitis; and I have encountered cases in which acute *otitis media* has been diagnosed as an acute abdominal condition. Such mistakes are more common in young children than in adults.

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THE RESULTS OF INTRANASAL INOCULATION OF MODIFIED AND UNMODIFIED INFLUENZA VIRUS STRAINS IN HUMAN VOLUNTEERS.

By F. M. BURNET AND M. FOLEY.[1]

(From the Walter and Eliza Hall Institute, Melbourne.)

IT is now fully established that the great majority of typical influenza epidemics are due to the activity of the virus first isolated in 1933 by Smith, Andrewes and Laidlaw[1] and usually called the virus of epidemic influenza. There are undoubtedly many infections with the clinical appearance of influenza which cannot be shown to be due to influenza virus; but with perhaps one exception (Francis *et alii*[2]), all large rapidly developing epidemics of influenza which have been studied have proved to be of virus origin. The problem of immunization against influenza is predominantly therefore one of immunization against the virus of epidemic influenza.

As in all such problems, the most profitable lead to a method of artificial immunization is a study of the processes by which the partial natural immunization of communities takes place. Such work has very largely taken the form of observations on the changes in the level of virus-inactivating antibody in human serum in their relation to individual or community experience of influenza. Such observations have been made in large numbers in England, America, Australia and Russia and the conclusions of all workers are in sufficient accord to allow a statement of the position as follows.

In any normal population influenza virus antibody is present in detectable amount in almost all serum, the titre varying greatly from person to person. The average level of antibody is lower before an epidemic than immediately after its passage. All individuals suffering from influenza show a sharp rise of antibody titre in the first ten to fourteen days after infection. A similar though usually smaller rise may be observed in many contacts who show no symptoms of influenza. There is a certain amount of evidence that persons with low initial antibody are more likely to contract influenza during an epidemic than those with a high antibody titre. The difference between the groups is, however, not very striking, and most authors consider that a high antibody titre is to be regarded as an indication of past infection and not necessarily as an indication of a high grade of present resistance to infections.

On the working hypothesis that a raised antibody level would be associated with an increased resistance to infection during an epidemic, most attempts at immunization have followed the conventional lines of subcutaneous injection of living or killed virus. Such procedures have been shown to raise the antibody level; but there is as yet no satisfactory evidence that they give protection against influenza. In ferrets and mice we have found that effective immunity can be produced by the administration of living virus attenuated by chorioallantoic passage and given intranasally (Burnet[3]). It has previously been suggested that this method may be applicable to the human subject, and a considerable number of inoculations by nasal spray have been given in previous years. With the use of the fully adapted strain "Melbourne" egg, no cases of influenza

[1] Work carried out with the aid of grants for research on virus diseases from the National Health and Medical Research Council and from Mr. E. Alec Cato, and with assistance from the Marion Carty Fund.

were produced and two small rises in antibody were observed amongst the 30 people tested. No evidence of its effectiveness or otherwise in giving protection against influenza was obtained.

When an opportunity arose of making some tests of immunization procedures in a group of volunteers it was thought that a considerable amount of information might be gained if three consecutive inoculations were given, with strains of progressively increasing virulence, and if serum samples taken before and after the course were studied for changes in antibody titre. In the light of subsequent experience the method adopted could certainly have been improved; but in attempting a new type of procedure with human volunteers, it seemed advisable to keep the methods as simple as possible. The spacing of the injections at intervals of one week instead of longer was partly determined by a factor outside experimental control—the date of a university vacation.

It was thought possible that by the use of such a series of inoculations subclinical infections might be produced in all subjects, the most susceptible acquiring at least a basal immunity from the attenuated first and second strains sufficient for them to withstand the final unmodified strain. This expectation was not fulfilled; but we consider that the experiment provides valuable data on the influence of antibody level on resistance to a standard exposure to infection, and offers useful leads for any further work on the immunization of human beings by infection with living virus. Incidentally it provides evidence of the value of the amniotic inoculation technique in making it possible to use unmodified human influenza virus and to reisolate it from patients with influenza, in both cases without having recourse to ferrets.

Subjects, Materials and Methods.

The subjects of the experiment were 15 university students, aged nineteen to twenty-six years, and two older subjects, aged thirty-nine and forty-one years. None had suffered from clinical influenza during the epidemic of winter 1939, and all were in normal health. The first two instillations of attenuated virus were given in the laboratory and the subjects were merely required to report any symptoms. Since the third instillation was with presumably virulent virus, it was thought necessary that it should be given in strict isolation, and that the subjects should be maintained free from contact with the community for at least seven days thereafter. Through the kindness of Dr. Ivan Maxwell the experimental party was accommodated in a large, well isolated seaside house, and as the experiment was made in August when normal holiday makers were absent, no difficulty was found in maintaining seclusion for the period.

Inoculations were made by spraying the stock virus, diluted 1:5 to 1:10 in saline solution, into the nose and throat with an atomizer. Two pressures of the bulb into each nostril and one to the back of the throat used about 0·25 cubic centimetre of material. In the absence of data at all relevant to the present experiment it was thought advisable to keep the dosage rather low. We can at least be certain that very much more virus was administered than would ever be received in the course of natural exposure to infection, and that each subject received an approximately equal amount under the same environmental conditions.

Blood was taken immediately before the first instillation and again seventeen to twenty days after the final instillation of active virus. Blood was also taken at the time of the illness from each of the subjects who contracted influenza and from two others without symptoms at the same period. The serum was separated, heated for 20 minutes at 56° C., ampouled and stored in a refrigerator. Throat washings were obtained from the patients at the height of fever and were sent at once to the laboratory for filtration and inoculation into chick embryos by the amniotic method (Burnet[4]).

Virus Strains.

1. "Melbourne" Egg. The "Melbourne" egg strain was developed in 1935 and maintained by infrequent passages at intervals of three to six months since; material was kept in the form of infected membranes in glycerol-Ringer solution at a temperature of about – 6° C. during the intervening periods. At the beginning of 1940 it was reisolated by two single pock transfers. The properties of the strain are apparently identical with those described in earlier papers (Burnet[3]). A stock emulsion recently prepared had the following characteristics. The titre on the chorioallantois was 15×10^8, the embryos dying in two days with typical hæmorrhagic lesions. Mice inoculated with undiluted virus gave lesions, 2, 1, 0, 0, at seven days. Two ferrets, Numbers 126 and 127, showed no symptoms or rise in temperature, but virus could be isolated from filtered nasal washings seven days after inoculation. Ferret 126 gave a serum-producing reduction of pock count to 0·15% under standard conditions—that is, only a weak antibody response. Ferret 127 was proved immune to subsequent test of a virulent strain. In amniotic tests septicæmic infection of the embryo occurred without characteristic lung lesions. The stock virus used in the experiment was prepared by grinding three chorioallantoic membranes and one embryo *minus* beak and limbs to a paste with quartz powder. Two volumes of glycerol-Ringer solution were added to the paste and after light centrifugation the supernatant fluid was stored as stock virus.

2. "Bur." Egg. "Bur." egg was derived from Smith and Andrewes's[6] "master strain" Bur. by passage on the chorioallantois for 72 generations. It is only incompletely adapted to this situation, producing poor foci and not being lethal for the embryo. In mice it is moderately virulent, a standard egg membrane emulsion killing undiluted and producing lesions to a dilution of 1:1,000. In ferrets it produces no symptoms or fever, but provokes an active antibody response; the result of serum titrations on two ferrets gave values of 0·005% and 0·00075% respectively against "Melbourne" egg virus. In amniotic tests typical lesions are produced and the pooled fluids from infected eggs contain up to 2×10^8 infective units per cubic centimetre. The stock virus was used in the form of pooled amniotic and allantoic fluids mixed with an equal volume of pure glycerol.

3. "Reid, A P I." "Reid, A P I" is the strain R isolated in July, 1939, and described by Burnet and Lush.[7] Turbinates from ferret 96, which had been inoculated with the original human material, had been preserved in glycerol-Ringer solution and had retained their power to produce infection by the amniotic route. The material used for the third experimental instillation was pooled unglycerolated fluid from eggs inoculated with either the original ferret material or the first amniotic passage. This fluid had a titre of over 2×10^7 infective units per cubic centimetre by amniotic titration. It produced a typical mild response in a ferret, with the initial temperature "spike" rising to 104·3° F., and a subsequent serum titre of 0·0009% against "Melbourne" egg. In mice no lesions or small grade I lesions were produced, and the mice were subsequently fully immune against approximately 100 minimum lethal doses of "Melbourne" mouse strain.

In summary these strains may be described as follows: (i) A fully egg-adapted strain, which had lost most of its specific pneumotropism and had no virulence and only mild immunizing power; (ii) a partially adapted strain, still pneumotropic and mouse-pathogenic, with no virulence for ferrets, but strongly immunizing; (iii) unmodified human virus causing symptoms only in ferrets and in the chick embryo inoculated amniotically.

Isolation of Virus from Throat Washings.

The patients were given 10 cubic centimetres of saline solution to gargle thoroughly. This was then mixed with 5 cubic centimetres of nutrient broth and sent to the laboratory, where it was dealt with the same day. The washings were first passed through sterile filter paper and then through "Gradocol" membranes of average pore diameter 0·8μ. The filtrates were inoculated into twelve-day chick embryos by the amniotic inoculation technique recently described (Burnet[4]). Usually five eggs were used with each filtrate. Subinoculations from infected embryos were made to further eggs, and further identification of the virus was carried out along orthodox lines.

Serum Titrations.

In view of the occasional discrepancy between serum titrations made by the egg membrane technique and by intranasal inoculation in mice, all serum was titrated by both methods. The tests followed the usual lines, the virus used being egg and mouse strains of "Melbourne". All dilutions were made in cold normal horse serum and saline solution, and mixtures were kept for two hours at refrigerator temperature before inoculation.

Clinical Data.

The inoculations were made on August 2, 9 and 17, with the first, second and third strains respectively. None of the subjects reported any symptoms after the first instillations. Several reported trivial nasal symptoms two to four days after the second instillation. Only in one case ("M.N.") did subsequent serum tests indicate a likelihood that these symptoms were due to infection by the second strain. This subject had a serous nasal discharge, commencing about sixty hours after the inoculation and clearing up within forty-eight hours.

After the third instillation three of the subjects had definite attacks of influenza. The instillations were given at 3 p.m., and the first symptoms were shown by the subject E.L.B. less than twenty-four hours later.

She experienced an irritation of the nose and a desire to sneeze about midday; by the evening her symptoms were those of a typical early cold, with sneezing and profuse serous discharge, but no toxic manifestations and no rise of temperature. On the following morning her temperature was 100·6° F. and she had typical influenzal symptoms, slight shivers, a severe headache, muscular aching, flushed face and running eyes. The subsequent course shown in the temperature chart (Figure I) was that of a mild uncomplicated influenza.

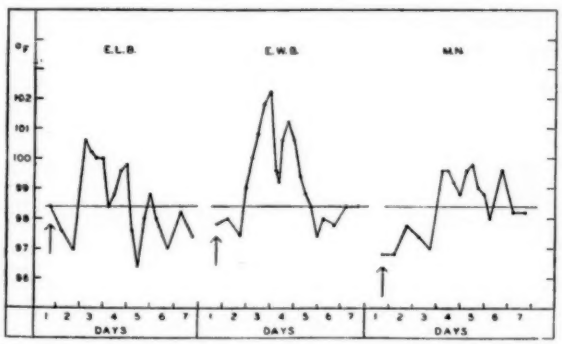

FIGURE I.
Temperature charts of the three subjects who developed clinical influenza. The arrow marks the time of the third instillation of virus.

E.W.B. woke up on August 19 (forty-one hours after inoculation) with frontal headache and slight sore throat. His temperature was 99° F., toxic symptoms increased and the temperature rose steadily to 102·2° F. at 10 p.m. He had a very flushed face and a pulse rate of 120 per minute, and he was obviously ill. At no time did he show any coryzal symptoms. The chart (Figure I) shows the sharply diphasic character of the temperature. Recovery was rapid, but, like E.L.B., he did not feel completely fit again for a fortnight, and lost sixteen pounds in weight.

M.N.'s illness ran a less typical course than the other two. She felt "out of sorts" on August 19 and had some serous nasal discharge. On August 20 (sixty-five hours after inoculation) she had slight shivers and headache, but her temperature was never over 99·6° F. There was some rise of temperature on each of the two subsequent days.

The only other subject to show any rise of temperature was M.S., who had a slight sore throat and a temperature of 99·4° F., fifty-one hours after inoculation. The following morning it was 99·6° F., but she had no general symptoms and her temperature was normal in the afternoon and subsequently. In view of the serological findings she must be regarded as having contracted an influenza virus infection in which an almost subclinical course was followed.

At the time of the experiment an unusual type of sore throat—"Puckapunyal throat"—was epidemic in Melbourne, and one member of the group, P.R.B., had a typical attack during the last two days of isolation with a temperature reaching 100° F. on August 25. D.C. had a sore throat at the same time and developed a more acute attack on his return home. Washings from his throat on August 28 yielded no influenza virus.

Reisolation of Virus.

Tests for virus in garglings were made by the inoculation of "Gradocol" membrane filtrates into twelve-day chick embryos according to the technique recently described (Burnet[3]). Virus was isolated from all four subjects showing a rise in temperature. In the primary tests the following results were obtained: E.L.B. + (+) (+) (+), E.W.B. + + – – –, M.N. + (+) (+) (+) (+), M.S. + (++) – –; "+" represents a positive result with typical cells in the tracheal smear, "(+)" a death presumably due to specific infection, and "–" a negative result three, four or five days after inoculation. Typical findings were obtained in all cases on subinoculation from positive primary infections.

One of us has recently suggested a third method of detecting the presence of influenza virus in throat washings (Burnet[3]) based on the fact that unadapted virus in fairly high dilution can immunize mice against virulent mouse virus. Unfortunately the tests were not made immediately the specimens reached the laboratory, but the membrane filtrates and portion of the initial (non-sterile) paper filtrates had been stored in a refrigerator and mice were inoculated about a week later. Fourteen days later a test inoculation of "Melbourne" mouse virus, diluted 1:100, was given. All the mice died with the exception of those receiving filtrates from M.N. Of the four receiving originally the unsterile paper filtrate, three survived with 1, 0, 0, lesions, while one of four given the "Gradocol" membrane filtrate survived with grade I lesions. Since the method requires no filtration apparatus and neither ferrets nor chick embryos, it may be of some practical use and is being further investigated.

With the development of the amniotic method it has been our aim to try to dispense with the necessity for using ferrets at all in influenza virus investigations, and all the strains were identified as influenza virus by the inoculation of mice with infected embryonic fluids and by subsequently testing them for active immunity and obtaining serum for neutralization tests. The details

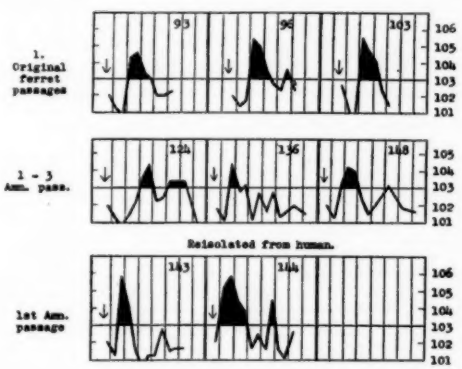

FIGURE II.
A series of temperature charts of ferrets inoculated with the strain R., (i) on first isolation in 1939, (ii) as first or second amniotic passage material prepared in 1940, (iii) as first amniotic passage material after reisolation from E.L.B. (ferret 143) and M.N. (ferret 144).

of this work will be reported later; here it need be said only that all the reisolated strains showed the normal characteristics of a "Melbourne" type influenza virus. Two strains, E.L.B. and M.N., were tested in ferrets.

Both ferrets gave an active response, a rise in temperature above 105° F., with an unusually short incubation period, in one case less than twenty-four hours, in the other about twenty-eight hours. This response differs quite strikingly from that given by first or second amniotic passage material, such as was used to induce the human infections, and was very similar to that given in ferrets inoculated with material from the original patient "R" (Figure II). This suggests that a certain diminution in virulence had occurred during the year during which the original ferret material had been stored in the refrigerator, but that a single passage through human beings had fully rejuvenated it. It must be recognized that this rejuvenation may have been effective only by increasing the titre obtained in embryonic fluids after inoculation.

Serological Tests.

All the specimens of serum were titrated by the chorio-allantoic method against "Melbourne" egg virus and by the standard mouse intranasal method against "Melbourne" mouse virus. The egg titration results are shown in Figure III, the changes being shown with a reversed logarithmic scale of the percentage of "surviving" foci. The method has been described in several papers (Burnet, Lush and Cade[20]).

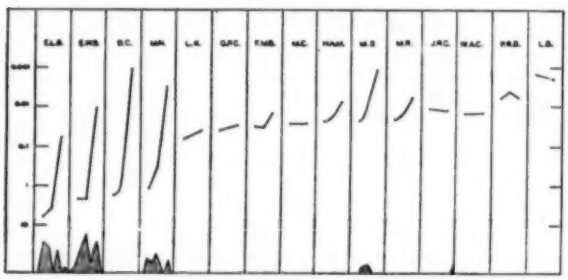

FIGURE III.

Antibody changes as determined by egg membrane titrations. For each subject the preliminary sample of blood was taken before the course of inoculations was begun and the final one two to three weeks after the last inoculation. An intermediate bleeding within four days of the final inoculation was also made in five instances. For convenience of reference a small chart of any febrile reaction after the third instillation is shown under each subject.

The mouse titrations shown in Figure IV are expressed in a similar fashion on the basis of the concentration of virus which, mixed with undiluted serum, will give an average grade II lesion in the inoculated mice. When the serum has to be diluted to give this end point, it is

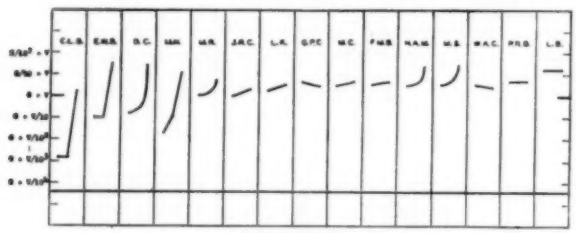

FIGURE IV.

Antibody changes as observed in titrations by intranasal inoculation of mice. The arrangement is similar to Figure III, the points indicating the ratio of serum and virus needed to give rise to average grade II lesions. The scale is logarithmic. The horizontal line gives the dilution of virus which, mixed with saline solution, produces standard grade lesions. S = serum, V = stock virus.

assumed that the same relation holds as has been found with egg membrane titrations, namely, that serum diluted to $1 : x$ mixed with undiluted virus would produce the same result as undiluted serum mixed with virus concentrated x times.

It will be seen that there is almost complete concordance in the results obtained by the two methods of testing.

Five subjects were tested for antibody soon after the third instillation of virus, at a time when only the influence of the first and second instillations would be shown. Four, including two influenza patients, E.L.B. and E.W.B., and two who did not show symptoms, P.R.B. and F.M.B., showed no change whatever; the fifth, M.N., showed a definite rise, an approximate tenfold increase in titre from the initial level. This change is clearly visible in both mouse and egg titrations. This is the only evidence from the chart that the first two instillations had any effect whatever. It is possible that they had a significant influence in the case of D.C., but it is probably best to ascribe this and all the other changes shown to the influence of the third instillation of unmodified virus.

On this assumption the most striking feature of the chart is the relationship between susceptibility to clinical infection under the standardized experimental conditions of exposure and the initial antibody level. All three who suffered from influenza had initial antibody below the 1% level by egg titration and the only other subject with a low antibody level showed a very active subclinical antibody response. All the other individuals had relatively high initial antibody levels, and none suffered from influenza, although four showed evidence of subclinical infection by a rise in antibody titre. In the case of one of these, M.S., who showed a sharp rise in antibody, there were minimal symptoms on one day which could reasonably be ascribed to the infection, but which could not be called clinical influenza.

Discussion.

Although so far as its primary object was concerned this experiment was a failure, we consider that it has supplied a good deal of useful information not previously available and has provided a basis for further work on human immunization. In the first place it has provided a clear indication of the value of the amniotic inoculation method for influenza virus research. It has shown that unlimited amounts of high titre sterile virus can be prepared in a convenient form and of any desired degree of virulence. The infections suffered by E.L.B. and E.W.B. were quite similar to the natural cases in the 1939 epidemic from which the virus was derived, and we consider it justifiable to assume that no significant change in the virus had occurred in the interim. Further, the experiment provided the first opportunity to show that virus could be isolated by the amniotic method from human throat washings. The procedure was successful in all instances, including that of the subject M.S., who showed only trivial symptoms. We may note here that subsequently it has been successfully applied in two natural epidemics by Captain G. V. Rudd and ourselves.

In natural epidemics it has been difficult to determine what, if any, influence initial antibody levels have on susceptibility to infection. The present experiment makes it clear that when exposure is standardized the antibody level has a dominant influence in determining the outcome.

With some reservations it seems justifiable to conclude that in susceptible human beings the administration of an amount of unmodified virus enormously greater than would be received in the course of natural infection produces precisely the same clinical effect as the natural infection. The dosage factor seems to be relatively unimportant provided it is sufficient to produce infection.

In retrospect we consider that more information could have been obtained if a longer interval had been allowed to elapse between the second and third instillations and if intermediate blood samples had been taken from all subjects with a low initial antibody level. This would have allowed us to decide (*a*) whether D.C. was actually immunized by the preliminary instillations, and (*b*) whether if the commencing antibody response of M.N. had been allowed to develop for a further week she might have withstood the test instillation without symptoms. Despite the doubts about these two cases, there is no doubt at all that neither E.L.B. nor E.W.B. was protected in any way by the preliminary instillations of attenuated virus,

and no evidence that these strains produced infection in them. Susceptible human beings must therefore differ in some essential respect from ferrets and mice in regard to their reaction to attenuated influenza virus. As a working hypothesis we may assume that the most important factor in preventing a "take" of the attenuated strains is the presence of the virus-inactivating agent (V.I.A.) of Burnet, Lush and Jackson[10] in the nasal and (probably) tracheo-bronchial secretions. If this is so, the problem of immunization by living attenuated strains is either to select a strain resistant to V.I.A. or to restrict the output of V.I.A. temporarily by some pharmacological manœuvre to give an opportunity for infection to be initiated.

We feel that the control of influenza by immunological means will never be a practicable proposition unless the immunizing agent is capable of being prepared rapidly and in very large amount and can be administered easily to very large numbers of people. Only egg-grown viruses administered by the natural route seem to offer at present the required potentialities, and despite the failure of our present attempt we hope to be able to continue work along these lines.

Summary.

1. A group of 15 volunteers received inoculations into the nose and throat of three strains of influenza virus of progressively increasing virulence.

2. Three subjects suffered from clinical influenza following the instillation of virus, which was considered to be of full human virulence.

3. Serological results from all subjects are shown in graphs. They indicate the high correlation of resistance to a standardized exposure, with high antibody level.

4. The attenuated strains administered appeared to have no significant protective effect.

5. Virus was readily reisolated from all subjects showing clinical symptoms by the inoculation of throat-washing filtrates into chick embryos by the amniotic route.

Acknowledgements.

This experiment was made possible only by the helpful cooperation of many individuals. We are especially grateful to Dr. Ivan Maxwell and Mrs. Maxwell for providing an ideal setting for the experiment at Dromana and for assistance in many practical details. Dr. C. H. Kellaway was largely responsible for the initiation of the experiment, and we are indebted to him not only for the bulk of the organization, but also for much useful criticism of methods and results. The fact that most of the volunteers spent a very pleasant holiday was largely due to the work of Mrs. N. Hamilton Fairley, Mrs. P. Whitehead and Miss L. Shaw, who undertook the provisioning, housekeeping and nursing required during the period of isolation. Finally we have to thank our subjects for their cooperation and interest. They were: Mrs. F. M. Burnet, Miss L. Barr, Miss M. Cunningham, Miss L. Keipert, Miss M. Nash, Miss M. Ross and Miss M. Shelton, and Mr. E. W. Bate, Mr. P. R. Bull, Mr. J. R. Collie, Mr. W. A. Cooper, Mr. D. H. Cowling, Mr. G. P. Cromie and Mr. H. A. Marks.

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SOME ASSOCIATIONS OF THE OLD HOBART GENERAL HOSPITAL.[1]

By W. E. L. H. CROWTHER,
Hobart.

I. YESTERDAY.

THESE few memories of the old General Hospital are prompted by its recent demolition and the erection on its site of the Royal Hobart Hospital. They are based on my own experiences and on chance remarks made from time to time by my father (E. L. Crowther, M.D.). At the opening of this century he had been for many years one of the honorary staff. It was his custom to visit his patients there late on Sunday afternoon as well as on his ordinary ward days. By walking there and back with him and using my eyes during the long wait in the hospital grounds, I am able to take my early memories back for some forty-five years. As a student and resident medical officer and now as a member of the honorary staff, my association with the hospital has continued with occasional breaks ever since.

In the late nineties the hospital, built in 1841-1842 as Her Majesty's Colonial Hospital and in later years known as the General Hospital, housed male patients of all ages (Figure I). The newer stone two-storey building, overlooking the Hobart rivulet in the back of the grounds, was the female block. There was no children's hospital, nor was any ward set apart for them; children were treated in the male or female wards. The site of the present children's hospital was then occupied by several small shops and the Union Hotel. This very old two-storey structure was the one in which, tradition has it, Lieutenant-Governor Davey spent much of his time when the formalities of his office were too much for him. Entrance to the hospital was through iron gates between two lodges each of cut freestone with slate roofs; they were given over to day and night porters respectively. Inside each was a small room with cedar cupboards flanking a mantel of the same wood. During the winter a generous coke fire was kept going, and here their cronies gathered in the evenings. There was no telephone from the gates, and the porter, having admitted the patient, took him or her to the casualty room and then set off in search of the resident medical officer or sister to be notified of the emergency. In later years the porters were given first a bell extension and eventually a telephone. Their hours were from 8 a.m. to 8 p.m. for day duty and from 8 p.m. to 8 a.m. at night. The two whom I remember best, named Nagles and Scurrah, wore a blue uniform with a peaked cap carrying the imperial crown. Just opposite the hospital gates lived Mr. Woods, the cabman, who was called on for transport in all emergencies. If I remember rightly, he drove at that time a black conveyance, the equivalent of the modern ambulance. Across the street was the old police station (Figure II), which many years earlier had served to house in part the female patients of the hospital. The old hospital, just demolished, of two storeys with attics, was faithfully built of an unexcelled

[1] Read at a meeting of the Tasmanian Branch of the British Medical Association on May 14, 1940, at Hobart.

sandstone that sustained the wear of ninety-seven years without becoming fretted. Its walls have been utilized in part to build the conservatory and retaining walls at the botanical gardens, Hobart. On each floor were four main wards and smaller adjoining rooms. Consider first the ground floor wards known as the accident flat and utilized for surgical cases. The wards were numbered 1, 2, 3 and 4 in little brass numerals and each contained some 20 beds; each had a large fireplace with a sandstone mantel and in front a long wooden bench, on which the convalescent patients sat and warmed themselves from a large coke fire in an iron container. Beside each bed was a small square Huon pine locker, and the shallow bowls in use beside the bed as well as on the dressing wagons were of pewter of much antiquity. Number 3 ward, the first on the left as one entered, was known as the accident ward, and here all patients with fractures and severe injuries were treated. Long Liston splints, MacIntyre's splints, and various wooden splints were used, and the bedsteads themselves were of iron and carried the ordnance broad arrow mark. Behind Number 3 ward was the ward in use for diseases of the bladder and for males with venereal disease. In those days primary and secondary syphilis were relatively common, our seafaring populace perhaps not being blameless. Male wardsmen were responsible for the immediate care of these patients, and conditions were, to put it mildly, unsatisfactory. Opening off from each of these wards was a small room about 12 feet by 15 feet in area, ill lighted and poorly ventilated. These rooms were used for any person who, it was considered, should have a room to himself—for example, any officer of the Royal Navy. It was the custom to send all ranks of the Royal Navy to the old hospital for treatment, and it was not until about 1912 (after an unfortunate engineer-lieutenant had spent nearly two months in one of these rooms, having rest and treatment for synovitis of the knee) that authority was given to transfer all officers to Highbury Private Hospital, then the only private nursing home in Hobart. One of the last and certainly most significant of patients was the late Honourable A. G. Ogilvie, then Premier of the State. As a result of a motor car accident he and his secretary were patients in such a room for about three weeks. It may well be that this experience of the conditions under which the staff worked was the prime cause of his splendid work in rebuilding and providing new and modern hospitals throughout the State.

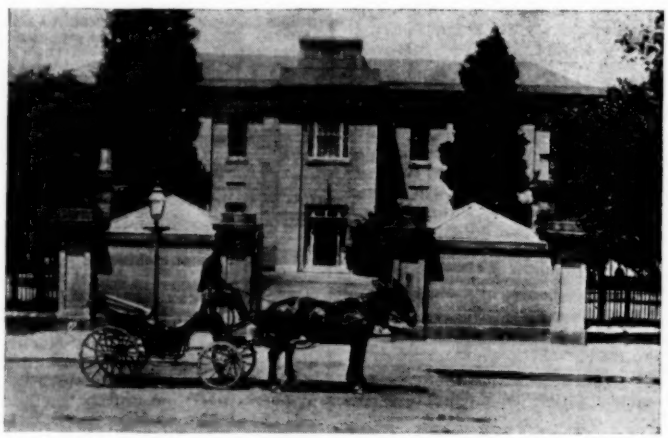

FIGURE I.

The remaining two wards served for surgical patients. Sanitation was limited, there being just two small privies and two baths for the whole four wards. The food was cooked in a central kitchen and carried on wagons across the yard to the flats. Those who were convalescent ate their meals in built-in verandas as the back of the wards. No water was laid on to the wards proper; it was carried from the bathroom.

From the front hall one went upstairs by a single steeply inclined flight of steps (my memory is that they were about 30 in number). Those unable to walk were carried up in a chair or on a stretcher by two attendants, and in all the years there is no record of serious accident caused by the attendants' slipping or allowing their burden to fall. At the top of the stairs the upper landing was large and well lighted. Its furniture included a splendid old mahogany bookcase; this, I believe, was once in the possession of James Scott, M.D., R.N., colonial surgeon, whose old medical volumes, when I was a house surgeon, were piled in large heaps on the floor of the dispensary. One of my deepest regrets, as a book collector, will always be that I did not take more than the five or six that I did take. When on returning from the last war I went back really intending to help myself, alas, they had all been sent to the municipal dump. Several I still have, one of which Sir D'Arcy Power showed me one night to have been printed from John Hunter's own press. There was, too, a long pine table on this landing, and on it or on a similar one all the surgery of the hospital was done, until at long last, in the nineties or perhaps a little earlier, came Listerian ideas and the provision of the operating theatre. Each surgeon had then a long black frock-coat which he used as a gown, and this was used and put back without being cleaned into the cupboard until needed again. Up from the landing went steep steps, this time to very large attics under the roofs, which were used for storage. From the landing led off four wards, Numbers 5, 6, 7 and 8, all the same size and of similar layout to those on the ground floor. In them all medical patients were treated, except those suffering from *delirium tremens* and mental disorders. During my period as a student there were as a rule some 10 to 15 patients suffering from typhoid fever under treatment at any one period during the summer months. I remember being told that during the worst of our epidemics there were in the hospital wards at the one time 100 sufferers from this disease. Though this may be an exaggeration, before the days of deep drainage typhoid, with pneumonia, was the most constant acute condition met with in the hospital. Erysipelas patients were sent upstairs, and I have seen seamen admitted to the hospital

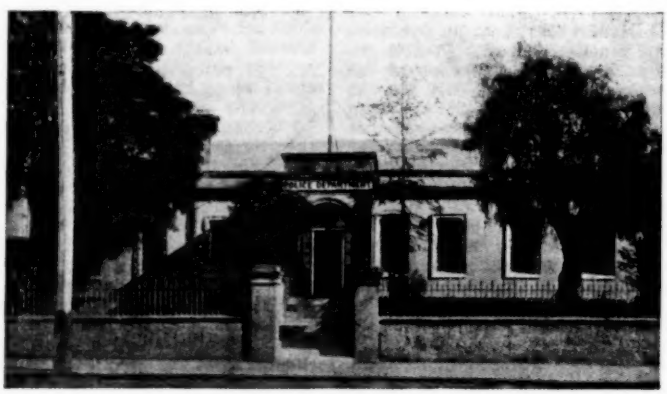

FIGURE II.

with acute scurvy. The severe and wide spread of outbreaks of poliomyelitis about this time gave us many patients who were not in any way segregated. Mention must be made of the cells used for patients with acute mental disorders and violent patients unsuitable for ward treatment. The cells were padded and had a mattress on the floor; some bed clothes and a leather bucket for sanitary purposes were the sole furnishings. A large barred area allowed the warmth of a coke fire to penetrate across a narrow passage to the cells. Here patients were kept until they had recovered sufficiently to be discharged, or after being certified to be transferred to the mental diseases hospital. Wide verandas were built on the front of the hospital about 1898, and they were of great value as fire escapes, as well as providing additional room for fresh air treatment, which was just being recognized as of value.

Well in the rear of the old hospital was the women's block, much more modern, but run in the same way. It occupied the site of the original hospital of 1821, and had been built between 1882 and 1884 as an isolation block. I do not know just when the women were moved from the four wards they occupied in the big main building to the very attractive freestone isolation hospital, or what was done with the infectious patients for whom it was designed.

Nursing, which had been a male function, came under the control of a lady superintendent when, in 1875, a Miss Abbott was appointed to that position. At the turn of the century Miss Johnstone Turnbull had been for many years matron. She was Scotch, very efficient and of very slight figure, and so was known to her nurses as "the mighty atom". A rigid disciplinarian and very just, her loyalty and correct professional bearing towards the honorary and resident staff were noteworthy. The widespread recognition of the merit of the nurses she trained is still a legend here. In those days it was the custom of certain of the sisters to remain on the staff for many years, often in charge of the one flat, in which they acquired a somewhat proprietary interest. One, if I remember correctly, had served as sister for nearly twenty years, and when she married rather romantically we felt that a great lady had left us.

The honorary medical staff consisted then of four seniors, Dr. E. L. Crowther, Dr. R. G. Scott, Dr. G. Sprott and Dr. E. J. Wolfhagen (I am uncertain just when Dr. G. H. Butler resigned his position for a more active political life). There were two junior honorary medical officers, Dr. W. W. Giblin and Dr. A. H. Clark, and Dr. L. S. Miller (eye, ear, nose and throat). An honorary medical officer then attended all the patients, medical and surgical, admitted during his "take in" week. It was a rigid rule of the hospital, however, that no major operation was to be performed until a full consultation of all the honorary staff had been held at the bedside. It was one of the duties of the senior house surgeon to send out the postcard calling such consultations, which, however, with the steady increase of surgery, gradually fell into disuse. They were of great interest to the young students, and I am sure that the clinical sense of the group who were in consultation would more than bear comparison with their opposite numbers of today. Listerian surgery had, I understand, been introduced in Hobart very largely by Dr. Wolfhagen and developed in the new operating theatre built in 1895 and fitted by private benefaction. Here we "scrubbed up" for three minutes by the clock and passed on to the bowl containing Condy's fluid for immersion of the hands; from this bowl we went to another containing dilute oxalic acid, and when the stain of the Condy's fluid had disappeared, the hands were regarded as ready for surgical work. The standard of general surgery attained was then a high one, and the results were good. The resident staff consisted of a senior and junior house surgeon, who were each allotted a well-built stone house, the assumption being that both would be married men. The senior house surgeon, Dr. E. J. Roberts, had, of course, the general control of the hospital. He was not interested in surgery and had no beds in the wards. It was customary for him and his junior, Dr. F. Rodway, to spend in rotation a period of three months in charge of the medical or surgical wards. They gave also, on alternate days, all anæsthetics. Every other day at 4 p.m. one went off duty until 9 the next morning. The other did all emergency and casualty work, calling on his colleague only if in difficulties. The out-patient department was in use on three mornings of the week; there was no differentiation as to diseases, and those who came were mostly old "chronics". The X-ray apparatus was the pride and hobby of Dr. Roberts. He must have been a pioneer in the treatment of chronic skin conditions by this method. His technique was to filter the rays through thin sheets of various metals. More and more of his time was spent on this work, and I am glad to say that just before his complete break-down in health, a thesis he presented gained him the degree of doctor of medicine of Melbourne. There were for help in pathology a laboratory and the nucleus of a museum of specimens. Both the resident medical officers were interested in the microscope, and did their own research and made occasional examinations for private practitioners. The first woman resident medical officer, Dr. Jessie Aspinall, was a great success, although the board thought such an appointment to be a somewhat startling innovation. It was the custom, and has been for about a century, to allow *bone fide* students to enroll and to have access to the clinical material of the hospital. In 1905 there were E. B. Moore, P. W. Mitchell and myself, combining a preliminary year of science at the University with the learning of as much as we were able at the hospital. It was not only a very valuable experience, but by the end of the year we knew beyond doubt whether or no medicine was our vocation. These conditions at the hospital remained generally until just before the war of 1914, when changes were afoot. A spate of Royal Commissions, beginning in 1914, resulted in changes both in the personnel and in the duties of the honorary medical staff as well as in other directions. It is not my purpose here to trace the sad history of the long hospital dispute of 1917, which must be left for some other occasion. These few reminiscences may, however, give the historian of the future some idea of the hospital, its functions, and its staff at the commencement of this century.

II. The Days Before Yesterday.

The following are some associations of the old colonial hospital found here and there in the course of reading. It is remarkable how many interesting references to the hospital are to be found in the early Press and in volumes of early travel, as well as in the autobiographies of men closely associated with the history of the colony.

First, perhaps, in interest is William Buckley, "the wild white man", who in 1803 was associated with the first and unsuccessful settlement of Port Phillip by Lieutenant-Colonel Collins, R.M. Buckley, then a convict, had been at one time a member of the Fourth Regiment of foot, and with three others was in personal attendance on the Lieutenant-Governor. With his companions Buckley made an escape from the camp, and, taking refuge with the natives, was never recaptured. Collins's expedition left Port Phillip for the Derwent, and Buckley passed out of memory until, over thirty years later, with a party of aborigines he came into John Batman's camp at Indented Head. It was found, in time, as he became able to speak once more in his native tongue, that for all this time he had lived the life of an ordinary member of the tribe, passing with them in their wanderings through the western districts of Victoria. His strange life story attracted much interest. After being granted a full pardon he was appointed district constable and interpreter at the Yarra settlement. Tiring of this position, he crossed to Tasmania and for the remainder of his life filled minor government posts. Among them was that of gate-keeper at the old hospital. My father told me that he remembered Buckley well. He described him as being a very tall, spare man (his actual height was six feet six inches), and quite a local celebrity. Buckley was, however, slow in speech and very dull witted. There is a lithograph picture of him in the autobiography published by Morgan at Hobart Town in 1852; in a copy that I have seen, written in a con-

temporary hand is the inscription: "A very good likeness." From the foregoing description and in view of his poor mentality, he may well have been our pioneer case of acromegaly. Both John Morgan and James Bonwick wrote accounts of the strange life of this man. Morgan's description was written four years before Buckley's death and some twenty years after his return to the settlement at the Yarra, and from all standpoints is very disappointing. Had Buckley had even the average Cockney mentality, his memoirs, even as elicited by Morgan, would have been of unique value to the anthropologist; as it is they are almost valueless. Buckley's long and interesting life came to a close when he was thrown from a cart and died from his injuries on February 2, 1856.

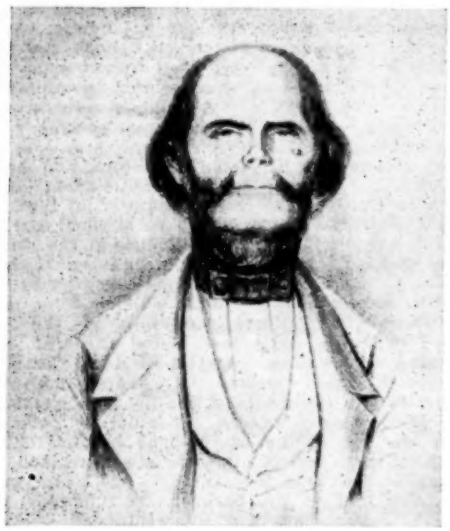

FIGURE III.
William Buckley. Contemporary lithograph, 1852; "a very good likeness".

Another member of the hospital staff who attracted much interest was Thomas Griffiths Wainewright, poisoner. This man, art critic, literary journalist and water-colour artist, was the intimate friend of Charles Lamb, Coleridge, Flaxman and their circle. Being in financial difficulties, he was foolish enough to forge a signature to a document concerning his mother's estate, in which, as a matter of fact, he alone was financially interested. It was for this crime that several years later he was to be transported to Van Diemen's Land. In the meantime much was to happen. It is supposed that in 1829 he poisoned his uncle; and three years later his mother-in-law died after a very similar illness, which was characterized by most violent abdominal pains and was almost certainly due to arsenic. In this same year (1832), after his sister-in-law, Helen Abercrombie, had died suddenly, it was found that Wainewright had insured her life for a total of no less than £18,000 spread over six insurance companies. The companies were suspicious and refused to pay, and Wainewright, fearing their disclosures, thereupon fled to France. On returning to London some years later he was arrested and put on trial, not for murder, but for the lesser crime of forgery. He was convicted and transported to Van Diemen's Land. Admitted as a patient to the old colonial hospital on January 12, 1842, he remained as a ward attendant for two and a half years. Such a man always attracts a good deal of attention, and he appears to have been in the good graces of the medical staff of the time. A report on his condition by Dr. James Mair, dated June 20, 1843, stated that he had been an inmate for almost eighteen months and was "suffering from a diversity of symptoms all indicating an enfeebled state of the system generally, with a peculiar proneness to gastric and nervous irritation". Dr. Mair was also of the opinion that this bodily weakness would prevent him from doing any laborious work. Dr. Clark, Dr. Crooke and Dr. Seccombe also wrote in a similar strain supporting the application of Wainewright for some such indulgence as a ticket of leave. This favour was, however, refused. He was nevertheless allowed certain privileges, such as the painting of portraits of selected people and the giving of lessons in the art of portraiture. Among the portraits that still are known are those of Dr. F. J. Clarke and Dr. R. N. Nuttall, as well as a charming picture of the youthful son of the former. During the recent meeting of the Royal Australasian College of Surgeons, a very interesting exhibition of his portraits was shown at the evening reception at the Tasmanian Museum. It is possible that paintings by him of other members of the old hospital staff may yet be found. His end came suddenly when he died of apoplexy at the hospital on August 26, 1847.

It is not easy to assess the character of such a man. His cynical remark that his sister-in-law deserved to be poisoned because of her thick ankles was possibly sheer bravado, born of a desire to impress his hearers. Here, at any rate, is a contemporary estimate of the man:

> His conversation and manners were winning in the extreme. He was never intemperate, but nevertheless of a grossly sensual habit; an Opium eater. As to moral character he was a man of the very lowest stamp. He seemed to be possessed of an ingrained malignancy of disposition which kept him constantly on the very confines of murder; and he took a perverse pleasure in traducing persons who had befriended him. There is a terrible story of his savage treatment of a fellow convict against whom he bore a grudge. Whilst at the Hospital the convict was brought in apparently dying. At a glance Wainewright detected the fatal premonitory symptoms on the man's face, and gliding to his bedside with catlike step, he hissed into the dying man's ears "You are a dead man, in twenty-four hours your soul will be in hell and my arm will be buried up to that (touching the elbow) in your body dissecting it".

FIGURE IV.
Thomas Griffiths Wainewright. Self portrait from original in the possession of Dr. Nuttall.

The memory of Wainewright has been perpetuated in the beautiful portraits he painted as well as by stories (in which he was the villain) written by Charles Dickens and Bulwer Lytton. Within the last year his life story has been fully described in a full-length biography entitled

"Janus Weathercock". Lastly, the ill-fated Oscar Wilde also made the poisoner the central figure of one of his essays. One might say that he has had a publicity that is far beyond his merits or demerits.

It may be felt that too much has been said about the humbler members of the hospital staff, and something should be told of some of the early surgeons. For example, Mr. Edward Luttrell, assistant surgeon, who was (to put it mildly) by no means *persona grata* with either the Governor (Colonel Macquarie) or his Lieutenant-Governors, and around whom still remains the aura of a romantic claim to the Earldom of Carhampton, some £14,000 a year and the lovely home of Dunster.

James Scott, M.D., R.N., who succeeded him, was more fortunate during his long term at the hospital. His marriage to Lucy Davey, a daughter of Colonel Davey, the Lieutenant-Governer, gave him not only social prestige but material fortune as well. It happened that Colonel Macquarie was in Hobart Town at the time of the wedding, and his wedding gift to the bride was a very large grant of land about New Town Hill. On this Scott built his splendid home, "Boa Vista", which, almost unchanged after a century, is still in active use as Clemes College. Mention should also be made of the two brilliant medical students he trained at the hospital, E. C. Hobson and E. S. P. Bedford. The former, an intimate friend of the Franklins and author of several very able contributions to scientific journals on natural science, died of pulmonary tuberculosis at an early age in Australia Felix (Victoria). Dr. Bedford returned to Hobart Town and later founded Saint Mary's Hospital, probably the first intermediate hospital in Australia.

A wider interest, however, attaches itself to a more humble member of the staff, one Benjamin Wait, a rebel from Lower Canada (now Ontario), who with a number of other Americans had in 1839 been transported to Van Diemen's Land because of a rising, the result of long-standing political discontent, which was designed to transfer that part of Canada to the United States of America. On the outbreak of the rebellion, a number of Americans, Wait among them, crossed the border in order to take part. Sir George Arthur (formerly Lieutenant-Governor of Van Diemen's Land) was appointed by the Crown as governor of the province, and at once used the fullest powers of the law against the leaders of the revolt, which he quickly suppressed. The United States Government, of course, did not attempt to succour its nationals, who had become outlaws by their actions. After long detention, several, Wait among them, were sentenced to transportation to Van Diemen's Land. Next year a further batch of 88 were shipped by the *Buffalo* to Sydney, and of them another 30 came on to this island. Wait eventually escaped from Van Diemen's Land whilst on ticket of leave, and wrote an account of his experiences in a book, "Letters from Van Diemen's Land", published at Buffalo, United States of America, in 1841. It is not the place here to describe his experiences in Canada or on the voyage out by the *Marquis of Hastings*. Wait, however, gives a very interesting account of the landing of the convicts at Hobart Town, and of their march as a body to the "tench" (prison barracks). Here, drawn up in a half-moon formation, they were addressed by the Governor, Sir John Franklin. He in the first instance addressed himself to the whole body of convicts. He informed them among other things and at considerable length that they were degraded as a result of their own shortcomings, that they would be narrowly watched and that their slightest misdemeanour would be punished. He informed them of the varying degrees of punishment at his disposal, passing on to speak with glowing eloquence of the benefits of the assignment system, and telling how eventually with good reports they might even become the possessors of a full pardon. Wait says the speech was a set one and occupied some time, being delivered with a hesitancy painful in the last degree to the listener. At its conclusion the convicts were dismissed, all except the Americans, to whom Sir John again addressed himself. They were told that they were lucky to have escaped retributive justice (that is, execution) and that in spite of their sobriety, morality and even piety, they might expect only the strictest watch and more severe punishment for any transgression of the law.

Indifferent health necessitated the admission of Wait and Chandler, a fellow American, to the hospital, and on their recovery they were retained as wardsmen. Wait does not give any description either of the hospital or of its working. He writes of the patients who were largely "old hands" (convicts) or emancipists. These last proceeded to inform Wait as to the mysteries that bound together the various classes of prisoners and ticket-of-leave men throughout the colony. He was told in considerable detail of the methods employed by the assigned servants in stealing from their masters, a process known as "weeding". The reception of the stolen goods and their disposal by the criminal underworld were also described. There is, too, a long account of the slang in use in these circles.

FIGURE V.
Benjamin Wait. Lithograph, 1841.

After two months as wardsmen the Americans, who had in their meantime picked up much that was to be of use to them, were assigned to a Mr. Roberts, of "Ashgrove", Oatlands. Later in the year, as a ticket-of-leave man and in company with Chandler, Wait returned to Hobart Town with plans for an escape. In a small fishing boat they put to sea; but it was not until several days later, when they were in a state of "danger, destitution and extreme anxiety", that they were picked up by the ship as arranged. This vessel was an American whaler doing for their fellow countrymen what was to be done again years afterwards for the Irish patriot, Thomas Francis Meagher. At a still more remote period his fellow countryman, John Boyle O'Reilly, one of the Fenian prisoners, was also to be rescued by New England whalers from Western Australia at the instance of sympathizers in New York. O'Reilly, as a result, gave us the wonderful narrative poem "The Amber Whale", which touches somewhat the "Moby Dick" theme. Wait gives no details of the voyage until at the end of seven months they were "permitted to hail with unsurpassed delight the gladsome shores of free America, ever an asylum for the oppressed". "Some day, however", he writes, "I may publish some popular sketches, with the minute details of my escape, occurrences on the passage home, chasing and taking whales, falling in with icebergs, gales, storms and subsequent shipwreck. Incidents during a month in South America and fairy scenes that baffle description; calms on the equinoctial line and thrilling anecdotes of a whaler's incidental life."

Alas! If he ever did write such a book, I have never been able to hear of any copy.

Much might be written of a similar group of interesting personalities who, although not members of the staff, were during much the same period patients at the hospital. James Kelly, navigator and explorer, Dumont D'Urville's cook and seamen, Jorgen Jorgensen, sometime King of Iceland, and William Lanne, the last Tasmanian male, are some that come to mind. They must, however, be left for another occasion.

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THE EFFECT OF EXERCISE IN HOT ATMOSPHERES UPON THE PULSE RATE.

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AND

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PROBABLY no single item of bodily reaction to hot atmospheres has received more attention in the literature than the pulse rate. This has been summarized elsewhere.[1] In spite of this, however, it is not possible to compile a table from which to predict the average reaction to given conditions of atmosphere and exercise. When the experimental examination of hot atmospheres in relation to tropical settlement was proposed it was necessary on this account to include observations on the pulse rate, as such measurements are both easy to make in the field and valuable as indices of bodily reactions.

These observations form part of an extensive experimental inquiry carried out under the auspices of the National Health and Medical Research Council,[2] the results of which are now in process of compilation.

Conditions of the Experiments.

The subjects were all males between the ages of eighteen and forty-five years, in good health, who were either members of the militia forces or students. Seven subjects were used in these experiments, but not all took part in all the trials. Each subject reported daily, on five days a week, for four weeks. The different experiments were scattered throughout the period to distribute the effects of acclimatization. The time of rising, of passing urine and of having breakfast were noted. Upon arrival the subject had a shower bath, dressed in the clothes provided, and sat down in the anteroom. Fifteen minutes before he entered the air-conditioned room a full set of "zero" readings was made of the various items to be followed. These were completed by weighing the subject immediately upon his entering the room. The subject remained in the air-conditioned room for seven and a half hours. During this time readings were periodically made of the various items being followed and fluid was administered at stated intervals. Exercise of the type and for the duration required was performed in the morning and again in the afternoon. Lunch of a light character was taken between the exercise periods. The clothing worn in the hot room consisted of woollen pants, woollen socks, woollen gloves and sand-shoes.

Two atmospheres were used: "hot wet" (dry bulb, 87·5° F., wet bulb, 83·5° F.), giving a relative humidity of 87% and an effective temperature of 83° F.; and "hot dry" (dry bulb, 101° F., wet bulb, 79° F.), giving a relative humidity of 38% and an effective temperature of 84·5° F. (Effective temperatures are calculated from the chart for subjects stripped to the waist.)[3]

Three different levels of water administration were tried: none, half replacement of fluid lost (40 cubic centimetres in the hot wet room, 60 cubic centimetres in the hot dry room) at fifteen minute intervals, and full replacement of fluid lost (double the previous quantities). Water administration was also compared with saline solution administration at half replacement quantities, (i) at intervals of fifteen minutes, (ii) at intervals of two hours.

Two types of exercise were used. In the first, the subject marched up and down the room at the rate of three miles per hour for two hours, pausing for three minutes every fifteen minutes to have readings taken. A rifle was carried during the exercise. In the second, the subject lifted a weight of 36·5 pounds once every fifteen seconds through forty-two inches. An automatic device returned the weight to the subject's feet after each lift, without the subject's intervention. The exercise was continued for thirty minutes with a three minutes' interval for readings in the middle.

The pulse rate was counted once every fifteen minutes, except immediately after the conclusion of an exercise period, when a continuous count was made and progressive figures were taken out every fifteen seconds, and during the lunch period, when no readings were taken.

Normal Reactions.

Normal reactions will be seen in those experiments in which full water replacement is given. If these (Figure I) are examined in detail, the reactions under other conditions can be compared with these as the norms.

Hot Wet Atmosphere: Marching.—The first exercise raises the pulse rate from an average of 88 to 102 per minute, and this falls slightly towards the end of the period. With the cessation of exercise recovery rapidly occurs. During the rest interval and during lunch the rate falls off a little to 85 per minute. In the second exercise period the rate rises to a definitely higher level of 110 per minute during the first half, but falls to 104 in the second half. Recovery rapidly occurs to a level only slightly higher than in the morning.

Hot Wet Atmosphere: Lifting.—The first exercise raises the pulse rate to 102 per minute from an average level of 88. Recovery rapidly occurs and the rate fluctuates about the previous resting level of 88 throughout the rest and lunch. The second exercise period results in a somewhat higher level of 107 per minute, with a slower recovery to a higher figure of 93, which is, moreover, unstable.

Hot Dry Atmosphere: Marching.—The first exercise period raises the pulse rate from an average of 85 to 101 per minute, which remains fairly steady. Recovery is rapid, but the rate in the rest period is slightly higher at 87 per minute, and rises to 90 after lunch. The afternoon work period maintains an average rate of 107 per minute. Recovery from this is rapid at first, but slows down later, to finish at the pre-exercise level of 90 per minute.

Hot Dry Atmosphere: Lifting.—The first exercise lifts the average resting pulse rate of 84 per minute to 102. Recovery is rapid, but this is followed by a slight temporary rise, which disappears by lunch-time. After lunch the pulse rate is raised to an average of 90 per minute. Exercise then raises it to 110. Recovery is slower and the rate reaches only 89 per minute.

Summary.

If comparisons between the two atmospheres and the two types of exercise are set aside for later consideration, the outstanding observation is that the afternoon exercise results in a greater rise of cardiac rate than the morning exercise. While this is due almost certainly in part to the accumulating fatigue of the day's activities, the taking of lunch seems to play an important part, as is indicated in the "hot dry" curves. This is in keeping with observations previously made in hotter climates with resting subjects.[4] Hot dry atmospheres are more important in this respect than are hot wet atmospheres.

Significance of Variations.

In the counting of an individual pulse rate an error of four could be made. The average deviation of the average from this cause is therefore ± 2. Differences between the level of two curves which consistently differ by more than this amount call, therefore, for examination. If the differences cannot upon inspection of individual curves be

attributed to an unusual reaction of any one subject, then the differences become of significance in the experimental comparisons being made. The same criterion applies when trends in the same curve are being compared.

It has been made possible by the design of these experiments to compare experimental sets which are identical in composition except for the variable to be studied. The only partial exception to this is in the average degree of acclimatization possessed by the subjects of the experiments. In most cases the average degree of acclimatization in the sets being compared is very similar, but in order to appreciate the possible influence of such differences as do occur it is desirable first to examine the influence of acclimatization as seen in these experiments. The knowledge is also desirable for its own significance.

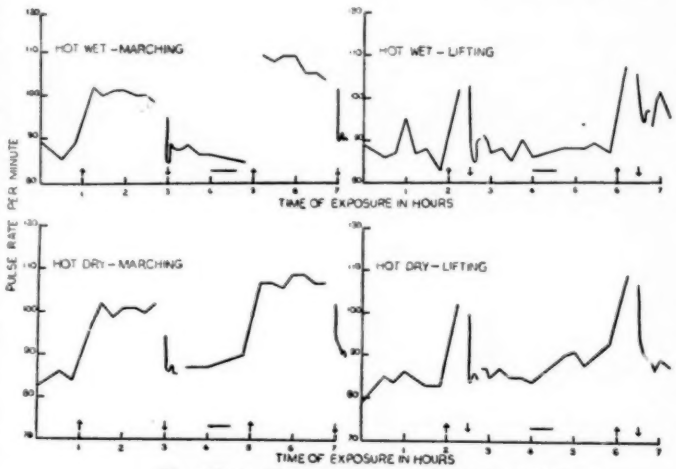

FIG. 1. NORMAL REACTIONS TO EXERCISE IN HOT ATMOSPHERES
(ARROWS INDICATE STARTING AND STOPPING OF WORK, LINE INDICATES LUNCH PERIOD)

Two subjects were exposed to the same hot wet conditions on two occasions, once near the beginning of the series of experiments on that subject, once near the end. On each occasion marching exercise was undertaken and water was given to half replacement of fluid lost at intervals of fifteen minutes. The comparisons reveal the following:

*Subject A*1.—Observations were made on the seventeenth day and on the sixth day. The pulse rate remained moderately low throughout; no essential difference was noted.

*Subject B*1.—Observations were made on the nineteenth day and on the eighth day. The pulse rate remained low throughout. In the less acclimatized the rate is slightly higher in the rest period.

Four subjects were exposed to the same hot dry conditions on two sufficiently separated occasions. Marching exercise was undertaken and half water replacement was given on each occasion. The comparisons (Figure II) reveal the following:

*Subject A*1.—Observations were made on the eleventh day and on the first day. The pulse rate remained moderately low throughout. In the less acclimatized the rate is lower throughout except in the afternoon exercise, in which it is higher.

*Subject A*2.—Observations were made on the fifteenth day and on the third day. The pulse rate remained moderate throughout. It was much higher in the less acclimatized in the morning exercise period, only a little higher in the afternoon exercise period. The recovery rates were not significantly different.

*Subject B*1.—Observations were made on the thirteenth day and on the third day. The pulse rate remained low throughout. It was somewhat higher throughout in the less acclimatized.

*Subject B*4.—Observations were made on the fifth day and on the seventeenth day. The pulse rate remained high throughout. It was much higher in the less acclimatized in the morning work period and somewhat higher in recovery; it was higher in the first part of the afternoon work period.

It would seem, therefore, that acclimatization has only a minor effect in hot wet atmospheres with the grade of exercise employed, but that it may play a significant role in hot dry atmospheres, especially in the subjects with higher pulse rates, and that the effect is greater with the morning than with the afternoon work.

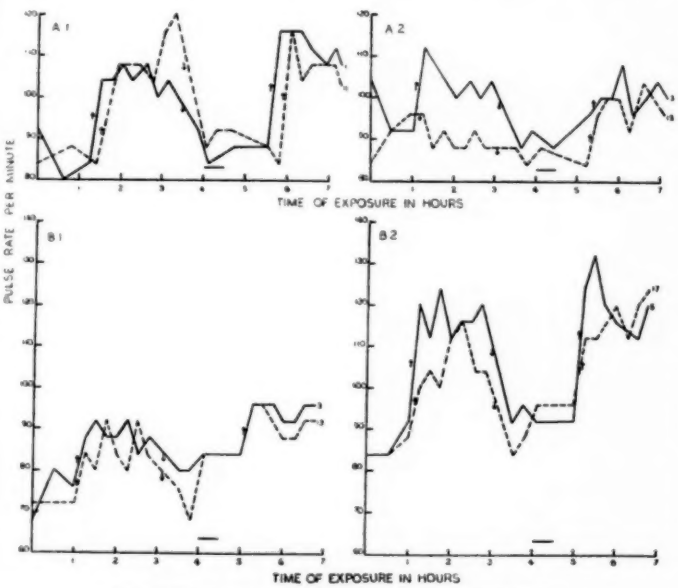

FIG. 2. EFFECT OF ACCLIMATISATION IN HOT DRY ATMOSPHERE
(— LESS ACCLIMATISED ----- MORE ACCLIMATISED, NUMBERS INDICATE SERIAL POSITION)

Effect of the Level of Hydration.

Previous investigations[4] have shown the importance of maintaining bodily hydration at an adequate level in hot atmospheres. It is important to know to what extent this factor enters into the economy of troops and labourers in tropical parts. The experiments in this series yield the following information when no replacement, half replacement, and full replacement are compared:

Hot Wet Atmosphere: Marching. — Hydration produces no improvement during the morning work or recovery. In the rest interval and in the afternoon work period half replacement, as compared with no replacement, progressively improves the rate up to seven beats per minute, and the recovery by five to ten beats. Full replacement gives no further improvement. [See Figure III (A).]

Hot Wet Atmosphere: Lifting. — Half replacement of lost fluid improves the rate by two to six beats per minute over the whole period up to lunch. While this disappears after lunch, it reappears as an improvement of six beats in the afternoon recovery from the work period and six to ten beats in the subsequent rest period. Full replacement gives no further improvement. [See Figures III (B) and III (C).]

Hot Dry Atmosphere: Marching.—Half replacement of lost fluid gives a pronounced improvement by three to ten beats per minute over the whole morning work period, and by

fourteen beats in recovery. This improvement declines to seven beats over the lunch interval. The improvement effected is five to eighteen beats per minute in the afternoon work period and thirteen beats in recovery. Full replacement gives no further definite improvement. [See Figure III (D).]

Hot Dry Atmosphere: Lifting.—Half replacement of lost fluid gives some improvement before the morning work, an improvement of four beats per minute during that work, and an improvement of seven beats in recovery. The improvement continues at this level until lunch and rises to eleven beats per minute after lunch. During the afternoon work period the improvement continues at nine beats per minute, rising to eleven to sixteen in recovery. Full replacement gives no further improvement. [See Figure III (E).]

Summary.

Full replacement of water lost gives no definite improvement over half replacement. Half replacement gives some improvement over no water in the hot wet atmospheres and pronounced improvement in the hot dry atmospheres—an improvement which becomes proportionately greater as the day progresses.

Comparative Effects of the Administration of Water and of Saline Solution.

It is well known that replacement of salt as well as of water is necessary when sweating is free. Such replacement is sometimes carried out by the giving of saline drinks in place of plain water. It has been reported that the effects of work have been reduced by the administration of saline solution during the work period. It is desirable to know whether this is so for the atmospheres and exercise employed in these experiments. The following information comes from an examination of the corresponding curves in these series. Marching was the exercise employed in each case, and half replacement quantities of water or saline solution were given.

Hot Wet Atmosphere: Quarter-Hourly Administration.—Trials with saline solution cause the pulse rate to be lower by four beats per minute during the morning exercise period and recovery, but are not essentially different after that.

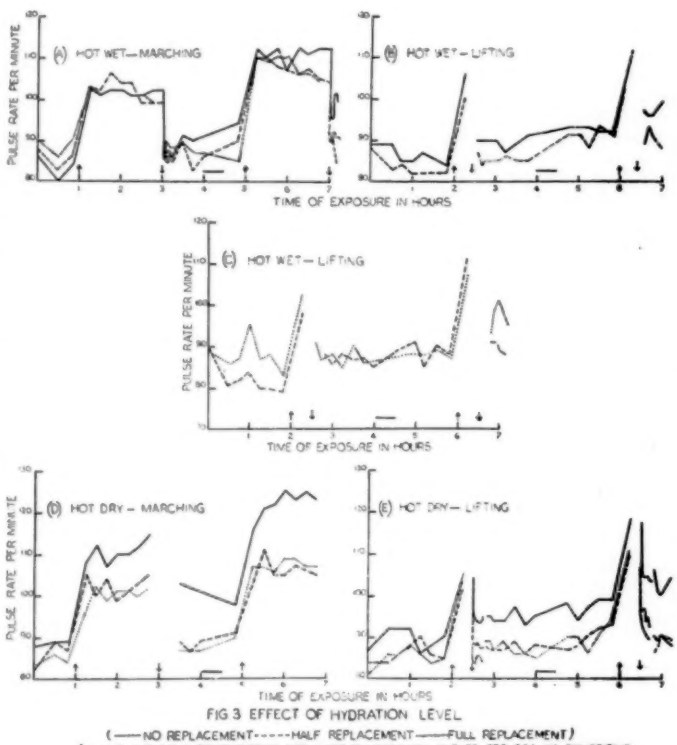

FIG 3. EFFECT OF HYDRATION LEVEL.
(——NO REPLACEMENT-----HALF REPLACEMENT——FULL REPLACEMENT)
(IN THIS AND FIG. 4 COMPARISONS ARE MADE ONLY BETWEEN CURVES FOR GROUPS COMPRISING THE SAME INDIVIDUALS)

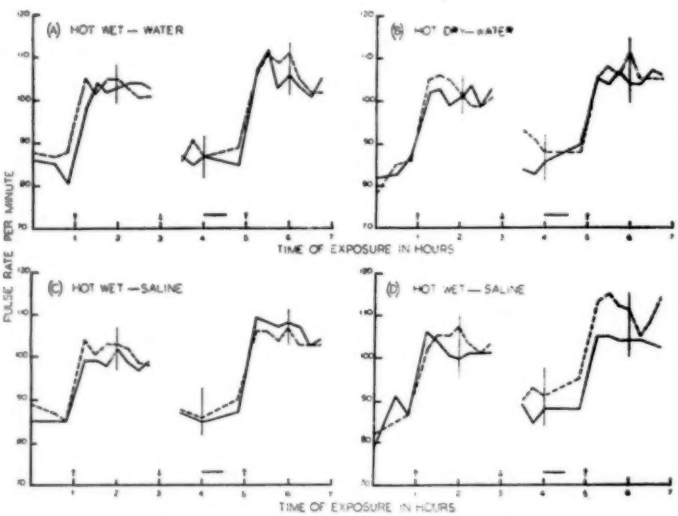

FIG. 4. COMPARISON BETWEEN FREQUENT AND INFREQUENT FLUID ADMINISTRATION
(——EVERY 15 MINUTES ----EVERY 2 HOURS)

Hot Dry Atmosphere: Quarter-Hourly Administration.—Trials with saline solution cause the pulse rate to be somewhat higher during the morning work period and recovery, but are not essentially different after that.

Hot Wet Atmosphere: Two-Hourly Administration.—After the first administration the pulse rate during work falls to a somewhat lower level with saline solution than with water, but recovery is unchanged. After the second administration the pulse rates at rest are equal, but the pulse rate at work rises five to six beats higher after water. After the third administration the pulse rates at work are equal, but recovery is to a somewhat lower level with saline solution.

Hot Dry Atmosphere: Two-Hourly Administration.—The pulse rates after each administration lie at a somewhat higher level after saline solution than after water.

Summary.

Saline solution gives something of an improvement in the hot wet atmospheres, but appears to be something of a disadvantage in hot dry atmospheres. This is somewhat unexpected.

Effect of the Frequency of Fluid Administration.

It is not always convenient to give fluid at very frequent intervals. It is necessary, therefore, to know what stresses may be entailed by the administration of larger amounts at less frequent intervals instead of small amounts at quarter-hourly intervals. The following information comes from an examination of the curves obtained in corresponding trials. Marching exercise and half replacement quantities were employed in each case; a period of two hours was the delay used.

Hot Wet Atmosphere: Water Administration.—When administration is delayed the pulse rate before administration rises three to eight beats per minute higher [Figure IV (A)].

Hot Dry Atmosphere: Water Administration.—The pulse rate before delayed administration is higher by three to six beats during the morning work period, by eight or nine beats during the rest period, and by nought to seven beats during the afternoon work. After administration the discrepancies disappear and the rate in the delayed administration trials

may become somewhat lower than in the frequent administration trials [Figure IV (B)].

Hot Wet Atmosphere: Saline Solution Administration.—The pulse rate before delayed administration is two to five beats higher in the morning exercise period, but somewhat lower in the afternoon exercise period. Disappearance of the discrepancy after delayed administration is slow [Figure IV (C)].

Hot Dry Atmosphere: Saline Solution Administration.—The pulse rate is higher in the delayed administration trials at all points except immediately after the delayed administration; it is three to ten beats higher before and nought to twelve beats higher after administration [Figure IV (D)].

Summary.

When administration of fluid is delayed the pulse rate in all cases rises higher. With the administration of saline solution the recovery is delayed or transient.

Comparison of Types of Exercise.

At first sight lifting may seem to be more strenuous than marching; but a comparison of the pulse rate curves does not support this view. Comparisons were made under several different conditions. The following results emerge:

Hot Wet Atmosphere: No Fluid Intake.—Lifting causes a pulse rate higher by four beats per minute in the first work period and by six beats per minute in immediate recovery, but otherwise there is no essential difference.

Hot Wet Atmosphere: Half Replacement Water Intake.—Lifting causes a slightly lower pulse rate than the average of marching in the first work period, but a rate of three to four beats per minute higher in the second period and recovery therefrom.

Hot Wet Atmosphere: Full Replacement Water Intake.—Lifting causes a rate slightly above the average of marching in the morning, but otherwise there is no difference.

Hot Dry Atmosphere: No Fluid Intake.—Lifting causes a pulse rate five beats less per minute than the average of marching in the morning, and eight beats less in the recovery therefrom. This discrepancy is lost by the end of the lunch period. The discrepancy returns at a level of five beats per minute in the afternoon and in the recovery. Acclimatization differences may account for a part of this discrepancy.

Hot Dry Atmosphere: Half Replacement Water Intake.—Lifting causes a pulse rate slightly lower than the average of marching in the morning, slightly higher in the afternoon.

Hot Dry Atmosphere: Full Replacement Water Intake.—There is no essential difference between the curves for the two types.

Summary.

In the hot wet atmospheres lifting tends to produce a somewhat higher pulse rate; but in the hot dry atmospheres it tends to be less exacting, particularly when water is withheld.

Comparison of the Hot Wet and Hot Dry Atmospheres.

The atmospheres used correspond to 86° F. effective temperature on the scheme drawn up by the Pittsburgh workers[3] for men normally clothed and carrying out light work. On the scheme for men stripped to the waist, however, which would be expected to apply more to our subjects, the hot wet atmosphere has an effective temperature of 83° F. and the hot dry atmosphere one of 85° F. Our experiments were designed to afford a comparison between these two atmospheres under all the experimental conditions used. The resulting curves yield the following information:

Marching: Half Replacement Water Intake—Quarter-Hourly Administration.—This series occurs twice. In one the only essential difference is in the late afternoon work and recovery, in which the pulse rate is four to ten beats per minute higher in the hot dry atmosphere. In the other the only essential difference is in the recovery from the afternoon work, in which the pulse rate in the hot dry atmosphere is about seven beats per minute higher.

Marching: Half Replacement Saline Solution Intake—Quarter-Hourly Administration.—The pulse rate in the hot dry atmosphere is nought to eight beats per minute higher in morning work, seven beats higher in recovery, and nought to six beats higher in the rest period. It is not significantly higher in the afternoon.

Marching: Half Replacement Water Intake—Two-Hourly Administration.—The pulse rate in the hot dry atmosphere is two to eight beats per minute higher in the rest period and the second half of the afternoon work period.

Marching: Half Replacement Saline Solution Intake—Two-Hourly Administration.—The pulse rate in the hot dry atmosphere is higher practically throughout, nought to seven beats per minute in the morning work period, three to eight beats during the rest period, and six to fifteen beats in the afternoon work period. Immmediately following the administration of fluid the discrepancy is temporarily somewhat reduced.

Marching: No Water Intake.—In both work periods the pulse rate in the hot dry atmosphere becomes progressively higher by six to thirteen beats per minute, and the recovery rates are higher by fourteen beats. During the rest and lunch period the discrepancy is progressively reduced to four beats per minute.

Marching: Full Replacement Water Intake—Quarter-Hourly Administration.—There is no essential difference between the two curves.

Lifting: No Water Intake.—There is no essential difference in the first work period. The pulse rate in the hot dry atmosphere is five beats per minute higher in rest period, eight beats in the second work period, and four to seven beats in recovery therefrom.

Lifting: Half Replacement Water Intake—Quarter-Hourly Administration.—The pulse rate in the hot dry atmosphere is slightly higher (three beats per minute) in both recovery periods; otherwise there is no essential difference.

Lifting: Full Replacement Water Intake—Quarter-Hourly Administration.—There is no essential difference until the afternoon work period, when the peak is three beats per minute higher in the hot dry atmosphere; but the recovery rate is six to fourteen beats per minute higher in the hot wet atmosphere.

Summary.

While there is no difference between the effects of the two atmospheres when ample water is given, the hot dry atmosphere has some heightening of effect when only half quantities are given, especially with the longer periods of marching. When no water is given, the greater effect of the hot dry atmosphere is very apparent. The administration of saline solution shows up the preponderant effect of the hot dry atmosphere more than does the corresponding administration of water.

Practical Applications.

Exercise, particularly more prolonged exercise, makes less demands upon the cardio-vascular system when undertaken in the morning than in the afternoon, especially in hot dry atmospheres.

While there is little need to pay attention to the acclimatization of subjects in hot wet atmospheres with the levels of exercise here employed, it may be of importance in hot dry climates if the cardio-vascular system is to be spared unnecessary stress. This is specially true of those subjects who have a labile pulse rate, of whom there seem to be an unusual proportion in Queensland, if the reports[5][6] of Commonwealth medical officers and Royal Australian Air Force recruit examiners are examined. These experiments were conducted upon Queenslanders. If men from colder climates are being transferred to tropical parts it is probable that acclimatization will be an even more important factor. Such transfers should be made, if possible, in the cooler season, and exercise after transfer should be graded over the first two weeks.

While it is best at all times to maintain bodily hydration at its normal level, there is a certain margin of reserve which can, if necessary, be traded upon. Four hours' marching without water in the hot wet climate here employed, which is the highest summer average found in Australia, takes the body just beyond this reserve. Half replacement of the water lost (160 cubic centimetres per hour) brings the body back into this zone. With marching in the hot dry climate, which is again the highest summer average occurring in Australia, failure to replace the water lost results in a pronounced deterioration of cardio-

vascular reactions. In this case replacement of half the water lost (240 cubic centimetres per hour) almost, but not quite, restores the body to its margin of reserve.

In the hot dry climate the administration of saline solution during the day does not, contrary to expectation, improve cardio-vascular reactions, but actually interferes with them. In the hot wet climate some improvement results. There would seem to be no reason for the administration of saline drinks on the march in preference to water. This does not mean, of course, that the salt lost in sweating should not be replaced; but it can be left to meal-times, when it is much easier to administer. In fact, the dislike for saline drinks by our subjects may have had something to do with the heightened pulse rate. It must be realized further that these strictures do not apply to very heavy work in very hot dry atmospheres, such as that performed by stokers.

It is undoubtedly preferable to administer fluid frequently in small quantities rather than infrequently in large quantities; but if administration is delayed, although the cardiac response is raised for the time being, it returns fairly quickly to normal after adequate fluid has been administered.

The lifting exercise here employed seems to be on the same physiological level as marching without kit.

The two atmospheres here employed are equivalent in their resultant effects upon the pulse rate, provided that all other conditions are normal; but if other stresses are introduced, such as dehydration, the hot dry atmosphere becomes proportionately more exacting. For normal conditions and moderate work the nomogram for the stripped subject for effective temperature shows no advantage over that of the clothed subject. For abnormal conditions allowance must be made for the preponderant action of the hot dry climate; that is to say, we go further and further away from the commonly accepted interpretation of Haldane's statement[7] that in hot environments the temperature on the wet bulb thermometer is more important than that on the dry bulb thermometer.

Acknowledgements.

Grateful acknowledgement is made of the financial help given to these investigations by the National Health and Medical Research Council, and of the seconding of two officers to take a leading part in the work by the Director-General of Health, Commonwealth Department of Health. Gratitude is also expressed to the other members of the team whose names do not appear in the authorship of this report. We are all also indebted to our subjects, who stood with fortitude the somewhat trying and monotonous conditions of the experiment.

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A DESTRUCTIVE SKIN DISEASE OF THE FACE IN NATIVES OF PAPUA AND NORTH AUSTRALIA.

By EDWARD FORD.

(From the School of Public Health and Tropical Medicine, the University of Sydney.)

IN 1915 Breinl, during a medical survey of the coastal region of Papua, noted the occurrence in natives of that area of a peculiar form of skin disease of the face, which caused destruction and scarring of the affected parts. The complaint pursued a chronic course over years, and healed spontaneously.(1)

Cases agreeing with Breinl's description were encountered among natives of eastern Papua, and of the islands of the D'Entrecasteaux group, which lies to the east of that region. The disease was also seen in aborigines of Bathurst and Melville Islands, which lie about fifty miles to the north of Darwin, and in a native of the Australian mainland near Yirrkala, on the coast of Arnhem Land. In the D'Entrecasteaux Islands 13 pronounced cases were seen among over 12,000 natives examined during a recent survey, while the condition was not found in 5,400 natives in the neighbouring Trobriand Islands.

The disease, occurring in a native of the island of Dobu, in the D'Estrecasteaux group, was termed "*bila bila*" by his fellow vilagers, and for want of another name has since been thought of under this title.

The active lesion, as Breinl remarked, somewhat resembles acne in appearance, although differences are seen both in the severe degree of resultant disfigurement and in the characteristic distribution of the lesions.

The nose was affected in every case, and the lesion sometimes extended to the forehead and cheeks, and less frequently to the upper lip. The peripheral parts of the face were never attacked, and in all cases the remainder of the body surface appeared normal.

The active lesions consist of pustules containing sebaceous material which hardens to form a firm grey core. In some of these healing results in the formation of scarred, rounded pits, some of the more recent of which display a reddish-pink base which is readily noticeable by contrast with the surrounding brown skin surface. In the majority of patients seen relatively few pustules existed at the one time among the healed lesions, although in some they closely covered the nose. In the latter the nose was much enlarged and presented a peculiarly rugged appearance, from the presence both of raised active lesions and of interspersed scarred depressions.

In an advanced case the affected area is closely pitted, and the surface acquires a glossy appearance from the presence of generalized scar tissue. The closely set depressions are often separated by hard, irregular ridges, which give to the region a finely ragged character.

The destruction associated with the condition is due to the long-continued superimposition of fresh lesions on the affected area, each recurring crop scoring the surface more deeply. This irregular erosion leads to great disfigurement, which is most obvious about the tip of the nose and the margins of the *alæ nasi*. The latter, in advanced cases, are often deeply and irregularly indented, as though nibbled away from the free border.

The disease pursues a chronic course over many years, and finally heals spontaneously. Owing to the difficulty of obtaining adequate clinical histories, the progress was in most cases not disclosed.

In the case of a Melville Island woman, aged about twenty-five years (Figure I) the still active process was indicated to have commenced at about the time of puberty. It first appeared as "pimples" on the nose, and after some time slowly spread thence to the forehead and cheeks. No other area was affected and the process still continued in these parts. Otherwise the patient had always been in good health, except for the results of a spear-thrust over the left clavicle. This was received long after the establishment of the facial condition, and resulted in a chronic inflammatory condition of the bone at the site of the injury, with a persistent discharging sinus. She was, from the facial disfigurement, regarded as suffering from leprosy by her native acquaintances, who have, however, little knowledge of that disease.

In another case the disease was still active in a Good-enough Island (Morata) male native aged about thirty years, and the lesion was similarly said to have commenced about puberty.

In two of eight cases reported by Breinl the uvula and soft palate showed scarring and destruction.(1) This feature was, however, not found in any of the patients recently seen.

In four cases cultures were made from sebaceous material obtained from the active lesions. In three of these

Staphylococcus albus was isolated. This organism was associated in one case with non-hæmolytic streptococci, in one with a Proteus-like organism, and in a third it occurred alone. From the other case *Staphylococcus aureus* was grown. Facility for anaerobic culture was not available, and material was not obtainable for histological examination.

FIGURE I.

Acknowledgements.

The observations in the cases mentioned were made during field work undertaken in Papua and North Australia by the School of Public Health and Tropical Medicine of the University of Sydney by direction of the Director-General, Commonwealth Department of Health. Arrangements were greatly facilitated by the Government of Papua.

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Reports of Cases.

GALL-STONES IN A BOY AGED ELEVEN YEARS.

By V. M. COPPLESON,
Sydney.

GALL-STONES in children, although not common, are probably more prevalent than is generally thought. Potter (1938), over a ten-year period to 1937, was able to discover the records of 204 cases by a search of the literature and personal communications. Of these, four (2·5%) were neonatal, 28 (17·2%) occurred in infants, 30 (18·4%) were in children between the ages of one and five years, 50 (30·6%) in children between the ages of five and ten years, and 52 (31·3%) in children between the ages of ten and fifteen years. In a series of 228 similarly traced by him between 1722 and 1927, two cases were fœtal and the others followed a corresponding gradation in the age groups. Females were affected slightly more commonly than males. "Many of the patients recorded in the literature", Potter states, "were diagnosed as appendicitis and the patients operated upon before the true condition was revealed".

Clinical Record.

The occurrence of gall-stones in a schoolboy aged eleven years is here recorded. The child, who on general appearance seemed normal and healthy, was admitted to the Royal North Shore Hospital on August 25, 1940; he was referred by Dr. Stuart Studdy. He had had pain in the left side of the hypochondrium and, to a less extent, in the right side of the hypochondrium, at intervals over a period of twelve months. He had had a very severe attack three weeks before his admission to hospital. The attacks had no relation to meals; there was a history of occasional nausea, but no vomiting. The pain did not radiate to the back; there was no qualitative anorexia for fats, and his meals consisted largely of carbohydrates. He had pain in the knees with some fever for one week prior to his admission to hospital, and a slight sore throat.

His previous illnesses and operations were: appendicitis, removal of tonsils and adenoids, circumcision, measles, whooping cough and diphtheria.

An X-ray film taken on August 15, 1940, prior to his admission to hospital was reported upon as follows: "Collection of gall-stones in the fundus of the gall-bladder. Gall-bladder functioning rather poorly."

A blood examination gave the following information: the erythrocytes numbered 5,500,000 and the leucocytes 9,900 per cubic millimetre. The hæmoglobin value was 78%. Except for the presence of a mild degree of hypochromic anæmia, the blood picture presented no abnormality and the possibility of acholuric jaundice being associated with gall-stones was excluded.

Operation was performed on August 27, 1940. A right paramedian incision was made. The liver was low, of infantile type, lying about three inches below the costal margin; it was firm and very vascular. The stomach was normal, the spleen of normal size, the pancreas firm; there were no adhesions from the previous appendicectomy. The gall-bladder was full, the walls were thin, and numerous vessels were seen on the fundus. Several gall-stones were felt free in Hartmann's pouch, one stone being impacted in the upper part of the cystic duct; but there was no apparent obstruction. The cystic duct was tortuous, but very small. The gall-bladder was removed. When it was opened, about nine or ten small black stones were found, the largest being five millimetres to seven millimetres in diameter. All were "mulberry" in type and without facets, the smallest being somewhat friable. The abdomen was closed without drainage. The patient made an uninterrupted recovery and was discharged from hospital on September 16, 1940.

A microscopic examination of the gall-bladder revealed evidence of an inflammatory reaction of mild degree in the cellular infiltration of the mucosa and fusion of some of the folds. Chemical examination of the gall-stones showed them to be composed of calcium bilirubinate.

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CÆSAREAN SECTION FOR PELVIC DEFORMITY. PUERPERAL ECLAMPSIA.

By MARY C. DE GARIS.
(From the Maternity Unit of the Geelong Hospital, Geelong.)

Clinical Record.

A MARRIED woman, aged twenty years, a *primipara*, who had had no miscarriages, was admitted to hospital on January 2, 1938. She had not attended the antenatal clinic, but had previously been admitted to hospital on December 11, 1937, with false pains, and discharged on December 18, on the understanding that she should report to the clinic; this she did not do. She had had osteomyelitis of the left hip at the age of five years, and had had ten operations at the Children's Hospital, Melbourne; she had used crutches for a period of twelve months. Her appendix had also been removed, and she said that sometimes material was still discharged from one of the bone sinuses. A large scar was present in the front of the hip and one at the back; when the patient walked, tilting of the pelvis and unilateral lordosis were noticed; one and a half inches of shortening were present. At the time of her admission to hospital she was in labour, fourteen days early, and a foot was presenting at the vulva. Cæsarean section was performed, partly to make sure of a living child, but chiefly lest the passage of the head through the pelvis should light up the old osteomyelitis.

A catheter specimen of urine before the operation was pale and clear; it contained a faint trace of albumin, no diacetic acid, no sugar, very scanty epithelial cells, scanty débris and no casts—there was no hint of the coming trouble.

The patient was delivered at about 2.20 p.m. of a living female infant, weighing six pounds six ounces; the baby was artificially fed from birth. The patient had her first convulsive seizure at 9.20 p.m. and her last at 4 p.m. the next day; she had 13 seizures altogether. She was febrile from the first to the eighth day, and again from the eighteenth to the twentieth day; the second febrile attack was regarded as pyelitic. At the time of the first convulsive seizure the urine was albuminous and contained hyaline and granular casts; the patient's systolic blood pressure was 168 millimetres of mercury and the diastolic 104. The next day the urine still contained some casts and slight œdema of the feet was present; on the following day the urine contained diacetic acid, but no casts. On January 6 the patient was conscious and answered questions; she had a rigor on that day and a shivering attack on January 7. There was an offensive purulent discharge from the upper end of the abdominal wound on January 7 and from both ends on January 10; the discharge was said to have a similar odour to the osteomyelitic pus. "Prontosil album" was given on January 8 and January 21. During the eclamptic and comatose period the patient's bowel was washed out five times; she received five doses of "Veratrone", each of 0·5 cubic centimetre, and three doses of hæmostatic serum. (I think that hæmostatic serum controls the œdema in these cases, and is especially helpful to stuporose or comatose patients, whose condition may be due to cerebral œdema.) The patient was discharged from hospital on the thirty-first day.

On April 8, 1939, she had another Cæsarean section and made an uneventful recovery. The urine before operation was almost the same as on the first occasion. She had attended the antenatal clinic from the sixth month of pregnancy.

Discussion.

It is obvious from the patient's subsequent history that she should not have been allowed to leave hospital in December, 1937, and that insufficient allowance was made for a lowered resistance and for the possibility that a latent infection might still be present in her system.

Reviews.

THE MEDICAL SCIENCES AND PUBLIC HEALTH IN GERMANY.

DURING the last three or four years there has been a spate of books on Germany and other European countries by writers whose claims seem to indicate that they either lived side by side with the various dictators (and their minions) or were consulted by them daily. And after reading a batch of these books one just wonders what the conditions really are, or have been. It is difficult enough even in this country for two witnesses of the same incident to give accounts in reasonable agreement. Where Russia, or Hitler's Germany or Mussolini is concerned, wishful thinking or anger often seriously distorts the truth.

The latest book, "Heil Hunger", is in some respects the most remarkable of them all, for it not only describes the conditions from the point of view of medicine, but it supports the facts by quotations from German journals and lists the references.[1] The writer, Dr. Martin Gumpert, "was formerly head of a large clinic in Berlin, and is a practising physician and surgeon". "He bases his book exclusively on Nazi sources, medical statistics in technical German magazines and the like. Neither anti-Nazi propaganda nor mere suspicion colour his findings". So at least says the cover.

The facts are startling to say the least, and we have (whilst feeling particularly cautious) been able to obtain some corroborative evidence of the details. If the facts are correct, then all the democratic nations have to do is to cut out their inefficiencies, stand up to their troubles, and hold on.

The Nazi régime has already produced a seriously weakened populace, with a remarkable increase in preventible disease and the prospect of a serious decline in the standard of medicine and of science in other related fields.

Two years before war was declared, the number of students in German universities had fallen from 85,394 (1923) to 43,034 (1938). The reduction in students and the dismissals (or voluntary departures) of professors and lecturers are much greater than is to be accounted for by the expulsion of Jews.

The main results seem to follow the evidence for two definite characteristics. In the first place the Nazi leaders have no sympathies with the German intellectuals, and this means with the properly trained and qualified men in every field; and in the second place they regard the most excessive athletic training as the first essential in all good and young Nazis. The consequence of the first of these is seen in the facts that in 1937 "there were 48,848 doctors in Germany and 12,407 so-called Nature healers (*Heilpraktiker*)". Moreover, special regulations not only legalized the activities of quacks, but "those who feel within themselves a special call to Nature healing can dispense with higher education or any form of examination. They may be admitted to the medical courses".

It is impossible in this review to give more than a few hints of the contents of this book—there is at least no padding in it.

Evidence is produced to show that even before war broke out the death rate among infants under one year old had gone up, so that it was 6·4% against 4·5% in New York; that rickets was seriously on the increase; that owing to the Nazi attitude to labour, tuberculosis was rampant; that a horrifying increase of tuberculosis had appeared in the slaughtered cattle (statistics given); and that diseases resultant from bad food—dysentery, food poisoning and typhoid fever—had all increased.

Amongst the amazing consequences of Nazi action is the assertion that the diphtheria mortality rate, which "declined by 68% in the U.S.A. and 2% in England, increased in Germany by 211·4% between 1926 and 1936". And surprising indeed for the country which gave us "Prontosil" is the statement that puerperal fever infections rose from 5,151 in 1933 to 7,965 in 1936—some 80% of the cases occurring in the birth clinics.

The author concludes by stating that his work has a double purpose: (*a*) to destroy the legend of the power-radiating healthfulness of the third Reich, and (*b*) to demonstrate clearly that Fascism is the most unwholesome political system ever born in the brain of man.

There is certainly serious evidence for the assertions made in the book. There is reasonable evidence that a *Blitzkrieg* was exactly the kind for which the Nazis were well prepared. And, whatever the truth of it all, there is a serious warning, not perhaps needed by the medical profession, but very necessary for those not familiar with the need for the constant watchfulness associated with a proper system of public health.

[1] "Heil Hunger! Health Under Hitler", by M. Gumpert; translated from the German by M. Samuel; 1940. London: George Allen and Unwin Limited. Crown 8vo, pp. 128. Price: 5s. net.

SURFACE ANATOMY.

PUBLICATION of the eighth edition of the now famous "Landmarks" is, sadly, accompanied by news of the death of the distinguished author, Bathe Rawling.[1] He had accomplished a really remarkable piece of work in this "masterpiece of omission and compression", and eighteen printings, covering eight editions since the first appeared in 1904, bear witness to the high value placed upon his efforts. In this edition the author has yielded to popular demand by adoption of the Birmingham revision (described as "British revision" in the preface) of the B.N.A. terminology, but has retained some of the old familiar names as alternatives. The new figures of the foot, first adopted in the seventh edition, are retained, and all the figures emerge with enhanced freshness—no doubt from new blocks. In the legend to Figure XXV *tali* is rendered as *stali*; otherwise there seems little upon which to comment. Apart from the changes noted, and a few minor verbal alterations, the book corresponds figure for figure and page for page—almost line for line—with the seventh edition. "Landmarks and Surface Markings of the Human Body" has been a standard anatomical adjunct for thirty-six years; it has maintained a high level while escaping the almost inevitable elaboration which accompanies successive editions of popular books. We trust that future editors will preserve the self-restraint of the original author.

[1] "Landmarks and Surface Markings of the Human Body", by L. B. Rawling, M.B., B.Ch., F.R.C.S.; Eighth Edition; 1940. London: H. K. Lewis and Company Limited. Demy 8vo, pp. 106, with 36 illustrations. Price: 8s. 6d. net.

The Medical Journal of Australia

SATURDAY, DECEMBER 21, 1940.

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CONTUSION OF THE HEART.

In a recent issue reference was made in these columns to the ultimate prognosis and rehabilitation in coronary occlusion. On that occasion a sharp distinction was made between coronary occlusion, characterized by the total obliteration of the vessel, and so-called coronary insufficiency which is due to partial occlusion or spasm; and it was shown that the outlook for patients who survive the initial attack of coronary occlusion is much more hopeful than it is generally supposed to be. Discussion on this problem of prognosis made necessary a reference to effort in relation to coronary occlusion. The reference was necessarily brief, and in view of recent work it has appeared that trauma in relation to this disease of the coronary vessels should be brought in somewhat greater detail to the notice of readers. The subject, however, is a large one and may be considered in two sections; in the present instance direct trauma only will be discussed and trauma by effort will be left for a later date.

Direct trauma of the heart may be the result of penetrating wounds or of a blow or crushing injury to the thorax; with the former we need not be concerned. Obviously a blow or a crushing injury may be so severe as to cause immediate rupture of the heart. Fracture of the ribs or of the sternum may be caused and fragments of bone may enter the heart wall or penetrate one of its chambers; the heart may also be compressed between the vertebral column and the sternum, and fracture may or may not take place. Mention must also be made of a most unusual case reported by Kellert in 1917, in which a man was digging in a sandbank which caved in; he was suddenly surrounded by sand up to his waist, and both heart and pericardium ruptured. Rupture of the heart may not occur at the time of injury, but after a variable interval of time, and the heart may fail without the occurrence of rupture. There is another type of lesion that may follow injury—contusion of the heart—and it is to this that we would direct special attention.

It is only during recent years that contusion of the heart has been recognized as likely to occur. In 1934 Claude S. Beck began a paper that he read at the annual meeting of the American Medical Association with the statement that most wounds of the heart were of the penetrating variety. When his paper was printed in the following year[1] he added a footnote to this sentence, stating that since he had made the report he had heard of so many probable cases of cardiac contusion that considerable doubt was thrown on the truth of his original statement. But the recent recognition of contusion of the heart as a clinical entity is probably shown best by a reference that Beck makes to *The Journal of the American Medical Association* of November 4, 1933. In this issue a question was asked by a physician in regard to the condition of a man who had been struck over the precordium by a golf ball. The reply in the journal was as follows:

> Mild infections may predispose to a coronary thrombosis, as mild infection of the upper respiratory tract, mild cystitis, or some minor ailment, and it is conceivable that the slight accident might have had some bearing on the coronary thrombosis. It is much more likely, however, that it was simply a coincidence. Traumatic myocarditis is one of those indefinite terms that is best not used at all, and there is no literature of scientific value on the subject.

Beck's interpretation was different; he thought that the golf ball bruised the heart, and it is probable that most cardiologists today would agree with him. Contusion of the heart was recognized before this, for in the course of a paper on trauma of the heart,[2] after giving details of a case in which cardiac contusion occurred, Hugh Barber mentions several cases seen by him previously, one in 1912. Apparently the force necessary to bruise the heart need not be severe. Beck points out that the ribs and sternum need not be fractured and that the wall of the thorax may show little or no evidence of trauma. This is not surprising if a moment's thought is given to the tone of the cardiac muscle and to the incompressibility of the fluid contents of the heart and great vessels. At the same time it must be recognized that the heart muscle will stand severe injury and yet recover. This has been shown by several workers. A. R. Moritz and J. P. Atkins studied the pathology of cardiac contusion in dogs.[3] They anæsthetized the dogs, opened the thorax, and bruised the heart by blows with a metal dilator weighing 68 grammes or with a wooden mallet weighing 335 grammes and having a flat striking surface measuring 4·5 centimetres in diameter. The animals were killed at varying intervals up to six months. Beck and Bright carried out experiments of the same kind and struck blows on the left ventricle of their animals with a metal instrument. In Moritz and Atkins's animals the functional changes varied, as would be expected, with the severity of the injury. Generally speaking, extrasystoles and irregularity occurred in those animals in which no myocardial injury was found *post mortem*. On the other hand ventricular fibrillation occurred in animals in which such extensive injuries as complete transmural laceration was found. At the same time it must be noted that two animals with ventricular fibrillation showed no myocardial change; one of these died after a few minutes of ven-

[1] *The Journal of the American Medical Association*, January 12, 1935.
[2] *The British Medical Journal*, February 26, 1938.
[3] *Archives of Pathology*, April, 1938.

tricular fibrillation and one survived two months after a spontaneous reversion to normal rhythm. To Beck and Bright the amount of trauma inflicted by them seemed to be excessive. "The myocardium became swollen with hæmorrhage and it looked as though softening and rupture would surely follow." In most instances they found that the trauma was remarkably well tolerated. The immediate response was a tachycardia, and the electrocardiogram showed changes similar to those manifested in coronary disease. Beck's conclusions from his experiments are that the heart can tolerate an excessive amount of trauma, that recovery is the rule rather than the exception, and that if death occurs it is caused by ventricular fibrillation, rupture or myocardial failure coming on after a tachycardia. From the foregoing it will be clear that when a patient suffers from a severe contusion of the heart an area of muscle will be put out of commission in much the same way as the area of heart wall in coronary occlusion is thrown out of action by deprivation of its blood supply. There is, of course, a fundamental difference between the areas in the two conditions—one is full of extravasated blood and the other is ischæmic. The clinical histories of the two conditions are vastly different; but when survival from the initial shock has been achieved and recovery is taking place, both symptoms and electrocardiographic findings may be similar. A person may suffer from both coronary occlusion and cardiac contusion, and Moritz and Atkins in fact record the clinical history of a man, aged seventy-four years, who had the misfortune to be so affected. This brings us to the appearances found at post-mortem examination. After a considerable time has elapsed the scars of cardiac contusion and of infarction due to coronary occlusion may be indistinguishable. This is emphasized by Moritz and Atkins, whose discussion on post-mortem appearances is clear cut and may with advantage be summarized. They point out that the objective criteria for the differentiation of cardiac contusion and cardiac infarct vary in usefulness according to the age of the lesions. The only evidence that should almost invariably serve to identify an otherwise indeterminate myocardial lesion as an infarct is the finding of recent coronary occlusion. Pathological changes likely to be found in early contusion include massive interstitial hæmorrhage, laceration and tissue disorganization. All these changes may, however, be seen following spontaneous rupture of an early infarct and are therefore not conclusive. In regard to older myocardial lesions, deposits of hæmosiderin are more likely to be seen in healed contusions than in healed infarcts; but since hæmosiderin is seen occasionally in healed infarcts, its presence is not conclusive. Three months after injury hæmosiderin is not often found in scars due to trauma, so that its absence in no way excludes the possibility that the lesion was of traumatic origin. "The presence or absence of remote coronary occlusion does not serve to identify a myocardial scar as having resulted from infarction or contusion inasmuch as a heart the seat of occlusive coronary disease may have a superimposed traumatic lesion and a heart with a large healed infarct may have no demonstrable coronary occlusion."

From what has been written it will be realized that cardiac contusion is of more than academic interest. Accidents frequently occur in which a person receives a blow over the precordium and, though recovery takes place, the patient may have a residual disability. One of the most usual accidents of this type occurs when the driver of a motor vehicle meets with an accident and is driven forcibly against the driving wheel. If the patient dies soon after the accident diagnosis will almost certainly be possible, but if death is long delayed the pathologist may be quite unable to come to a decision. In these circumstances diagnosis will have to be made by the history of the case. The condition itself is full of interest and will make an appeal to the imagination; it is therefore likely that the clinician may be tempted to diagnose it on slender grounds. In many instances questions of insurance and compensation may arise, and this clinical and pathological entity must be diagnosed only with the greatest caution.

Current Comment.

FŒTAL ACTIVITY AND NUTRITION.

IT is a relief to live in a time which has become almost free of the superstitions of our grandmothers, who feared that the impressions and experiences of the expectant mother would produce all sorts of deformities in the fœtus. No longer, we are glad to say, do expectant mothers secrete themselves in their rooms lest they be frightened by a spider, snake or cow, and their child be born deformed. It is right and proper that a better understanding of the mechanism of inheritance has exposed the myth of maternal impressions and raised the management of pregnancy to a more commonsense and scientific level. But we may ask whether we have not become too glib in our dismissal of the significance of environment. The importance of the gene no one will deny. At the same time we should not forget that environmental factors press unrelentingly on the parent, and the more clearly adult physiology is understood, the plainer does it become that the response to environment is oftentimes determined by the release into the blood stream of chemicals, many of which can probably pass the placenta. An experimental illustration is the observation by a number of workers that injections of the growth factor of the anterior pituitary into pregnant animals causes an increase in the size of the fœtus and many stillbirths. It seems likely too that certain physical stimuli from the parent's environment can be directly perceived by the fœtus. A timely reminder that such factors are not without significance comes from L. W. Sontag in the form of a study of the effect of fœtal activity on the nutritional state of the infant at birth.

A preliminary study published by Sontag and R. F. Wallace in 1934[1] presented very suggestive evidence that it is not only chemical substances passing the placenta that can evoke responses from the fœtus, but that purely mechanical stimuli, such as sound waves, are perceived by the fœtus and arouse reactions. A specially designed apparatus recorded fœtal movements, and it was found that these increased in response to vibratory stimuli. It has been reported too that women complain of increased movement as a result of loud noises. Thus one woman at a concert felt severe fœtal movements every time the audience applauded. It has been suggested that this activity of the fœtus results from an involuntary contraction of the abdominal muscles by the mother. Sontag feels that it is due to direct perception of sound waves by the fœtus. He mentions attempts to stimulate fœtuses obtained from therapeutic abortions, pointing out that a response to mechanical stimuli has been obtained in a fœtus as young as two months of age. Another factor causing an increase in the fœtal activity is emotional distress in the mother. The response is in this case

[1] *American Journal of Diseases of Children*, November, 1934.

probably due to the passage of a chemical substance, perhaps adrenaline, through the placenta. Fatigue and in some cases the posture of the mother are also known to increase fœtal movement.

In his latest report Sontag[1] is concerned with the effect of fœtal activity on the nutritional state of the infant at birth. He has attempted to explain why some infants at birth are fat and some apparently poorly nourished. The fœtus needs food for growth, for basal metabolic activity and to provide energy for movement. Unless the diet of the mother is grossly deficient, there is always an abundance of food in the blood reaching the maternal side of the placenta. There is evidence to suggest, however, that the placenta has little reserve in its ability to pass this food through to the fœtus in adequate amounts. Thus it has been shown by F. L. Adair and H. Thelander[2] that there is a definite relationship between the size of the placenta and the size of the fœtus. "This is well illustrated in twin pregnancies in which one fœtus receives the larger blood supply from the major portion of the placenta. The one whose vascular system is connected with the smaller portion of the placenta may be smaller than its mate and may even succumb." It must be admitted that L. B. Flexner and R. B. Roberts[3] have shown that the variable size in litter mates in new-born rats is independent of the amount of diffusion of a single test substance through the placenta. These workers conclude that fœtal size in rats is determined by genetic influences alone and not by variable diffusion of food through the placenta. At the present stage we prefer to accept the conclusions based on observations in the human than to apply to man the results obtained with rats. Sontag too accepts the conclusion that the nutrition of the human fœtus is restricted to a level, usually adequate for its needs, by the limited "importation facilities" of the placenta. He then advances the exceedingly interesting thesis that since the energy requirements of all fœtuses for growth and basal metabolic activity are approximately the same, therefore variation in the nutritional state of the new-born infant is determined by the amount of fœtal movement that takes place during the latter months of pregnancy. A large number of observations recorded by Sontag and his colleagues suggest that his theory is correct. He found that although light babies may have been active or inactive fœtuses, and inactive fœtuses may be either light or heavy babies, yet no heavy babies had been active fœtuses and no active fœtuses were heavy at birth.

Observations along these lines are being continued, and further reports are to be expected. In its immediate and restricted application, the relationship between fœtal activity and nutrition, Sontag's work is important and exceedingly interesting. In it, however, we see a wider significance, and one even more interesting and important, for it has reopened and emphasized the relationship between maternal environment and fœtal development and welfare. We may yet see the day when we realize that not only nutrition, but the whole physical, mental and psychic constitution of the new-born infant is influenced by the environment of the mother during pregnancy.

[1] *American Journal of Diseases of Children*, September, 1940.
[2] *American Journal of Obstetrics and Gynecology*, 1925.
[3] *The American Journal of Physiology*, December, 1934.

PUBLIC ACCEPTANCE OF FACILITIES FOR THE DIAGNOSIS OF TUBERCULOSIS.

THERE is good reason to think that the people of this country are ready to become enlightened and to take advantage of facilities for the diagnosis of tuberculosis. Two years ago in Sydney a single worker in a single year applied tuberculin tests to over seven thousand persons, representing 0·5% of the population, all of them volunteers. We may obtain some idea of what is to be gained from the wider provision of facilities for early diagnosis from an account by M. Cañizares and C. Ongpin, of Manila, of the trend of public response to the provision of diagnostic facilities in the Philippine Islands.[1] The number of persons presenting themselves for X-ray examination at the Quezon Institute in Manila has risen from 93 in 1929 to 17,242 in 1939; of these, the number found to be suffering from tuberculosis has risen steadily from 80 in 1929 to 6,503 in 1939. But whereas at first some 79% of sufferers were already in a moderately advanced or far advanced stage of consumption when their disease was recognized, this proportion has steadily declined till now only 56% have moderately advanced or far advanced disease. The authors comment that while this increasing public response is apparently satisfactory, the proportion of persons discovered with early tuberculosis is still less than that found in random surveys of the population, so that there is still room for further improvement in the response. In addition to the facilities offered by the Quezon Institute, the travelling X-ray clinics of the Philippine Bureau of Health and the various dispensaries of the Philippine Tuberculosis Society are now examining some 120,000 persons annually and among these finding some 15,000 fresh sufferers from the disease. It is clear that the tuberculosis problem in the Philippine Islands is much more pressing than it is here; but there is reason to think that the same kind of results would accrue here if the problem were attacked in an equally business-like and scientific fashion. In fact, as we pointed out in an article on the dynamics of crowd infection in these columns on July 13, 1940, the spread of an idea in the public mind can be shown to obey exactly the same mathematical laws as the spread of a contagious disease in a community or the growth of bacteria in a finite medium.

We have in our capital cities public clinics; but comparatively few people who are not very fearful or very ill will face the hours of waiting that are so often necessary before they can see a physician, while only in one or two are there facilities whereby members of the public or even the contacts of patients can attend outside their working hours. In Sydney at present miniature radiography is available to suitable persons in the evening after working hours. We learn that in the six months since it became known that facilities for miniature radiography of the chest can be arranged privately and at moderate cost by the New South Wales Department of Public Health, over one thousand persons have made inquiries and have been examined by the method; consequently many sufferers from tuberculosis have been recognized and placed on the road to recovery before great damage has been done to their lungs. As Cañizares and Ongpin point out, however, a much wider acceptance by the public of the facilities offered them may be expected if all available means are taken to acquaint them of their existence and if greater cooperation is sought by the public health authorities with family doctors, business concerns and educational institutions.

[1] *The Bulletin of the Quezon Institute*, July, 1940.

WAR SAVINGS CERTIFICATES: AN APPEAL.

CONDITIONS are very different in Australia from those of the Old Country. In this country life goes on in what is to all intents and purposes a normal fashion; our sports and holidays are uninterrupted, and all we know of bombers is the story that we hear from day to day of our kinsmen's sufferings, of the slaughter of men, women and children, of hospitals razed to the ground, and of the destruction of noble and historical buildings. We have to find money for the equipment of our fighting forces. A million and a half Australians are subscribing to more than 20,000 war savings certificates groups, and £16,000,000 has been raised. The first cycle of payments is being completed and an appeal is made for increased effort in the face of the enemy.

Abstracts from Medical Literature.

MEDICINE.

Follicular Hyperkeratosis.

JOHN PEMBERTON (*The Lancet*, May 11, 1940) has described a cutaneous eruption in children similar to those described by older writers as *lichen pilaris* and *lichen spinulosus*, nutmeg-grater skin and scorbutic gooseflesh. Crops of enlarged hair follicles appeared on the extensor aspects of arms, legs, buttocks, back and abdomen; the rash was symmetrical and not irritating. About 5% of 3,000 children examined had this rash, but it was not found in children under five years of age. Biopsy was performed on a boy of fourteen. This revealed a general degree of hyperkeratosis; sebaceous glands were completely absent and hair follicles distended, with hair shaft poorly formed and sometimes cut in several pieces. The diet eaten by this boy was deficient in nearly all factors except carbohydrates and possibly iron and vitamin B_1. The appearance of the skin was like gooseflesh, except that it was dry; small spinæ of horny material protruded from the hair follicles, which gave a rough feeling and suggested the name nutmeg-grater skin. These skin changes are similar to those described by Pillat and Frazier and Hu in 1929 and 1931 as occurring among Chinese soldiers, which were thought due to deficient vitamin *A*. Lowenthal in 1933, in East Africa, described a similar eruption in natives on deficient diet; night-blindness, xerophthalmia and acne accompanied the rash. In 1933 Nicholls found a similar condition in prisoners in Ceylon. He called it phrynodermia. In 1934 Goodwin and Mackay reported a case in London. All the reported patients have been treated mainly with full diet and one ounce of cod liver oil a day, though other vitamins are given to some. The effect of treatment is usually good. The condition is probably an early sign of a deficiency of vitamin *A* or of fat.

Vitamin E and Muscular Dystrophies.

THE possibility that muscular dystrophy in the human being was related to the type of muscular dystrophy observed in the guinea-pig and rabbit maintained on a diet deficient in vitamin *E* suggested the investigation of the influence of the addition of vitamin *E* (wheat germ oil) to the regular diet of a number of patients with muscular dystrophy and muscle atrophy. Simon Stone (*The Journal of the American Medical Association*, June 1, 1940) has administered daily 30 minims of wheat germ oil to a group of seven patients suffering from muscular dystrophy, and the observations have progressed far enough to enable definite conclusions to be drawn. The substance found in wheat germ oil and designated vitamin *E* is probably akin in nature to the vitamin *B* complex and is composed of many factors, each having its own sphere of influence on the processes of growth and metabolism. The exact part played by vitamin *E* in the process of proteolysis and its influence on muscle metabolism have not yet been fully determined. The fact that both the dystrophies and the states of threatened abortion are relieved by administration of wheat germ oil would imply the possibility that in both instances the activity of the vitamin is inhibitory to the anti-proteolytic substances in the blood serum which by their activity interfere with normal metabolism of protein and its transformation into normal muscle tissue. In all cases treated in the group under observation definite improvement has been obtained and manifested by gain in muscle strength, disappearance of fatigue and muscle pain on slight exertion, change in muscle texture and displacement of dystrophic musculature by normally contracting muscle tissue. The addition of the vitamin *B* complex to vitamin *E* appeared to increase the therapeutic benefit of the latter in the cases of nervous system involvement.

Bacterial Endocarditis.

H. H. STEELE (*The New England Journal of Medicine*, June 27, 1940) discusses the effect of sulphanilamide on the length of life of patients with subacute bacterial endocarditis. Fourteen patients in whom the blood culture yielded *Streptococcus viridans* were treated with sulphanilamide, three to four grammes a day. In five patients the bacteriæmia diminished during treatment. The white cell count was between 9,000 and 14,000 per cubic millimetre, with an increase of polymorphonuclear cells. In several cases the count fell to 600; but this was probably not related to sulphanilamide, since the same change was observed in those not treated with the drug. The red cell count fell in most cases, probably as a result of the disease. One patient developed a macular erythematous rash over the left side of the body. His bed was so situated that the sun shone on the left side of his body from 1 o'clock p.m. onwards. For this reason sensitization to sunlight by sulphanilamide was suggested as the ætiological factor. In a group of 30 patients who did not receive sulphanilamide, the time of survival varied between two and seventeen months, the average being 5·6 months. Among ten patients who received about three grammes of sulphanilamide for one to eleven months after onset, the average time of survival was 5·6 months. Three untreated patients lived longer than eleven months, whereas none of the treated patients lived so long. The conclusion is that sulphanilamide does not prolong the life of patients with subacute bacterial endocarditis due to *Streptococcus viridans*.

J. HEYMAN (*The Journal of the American Medical Association*, June 15, 1940) has reported recovery of a patient suffering from subacute bacterial endocarditis after treatment with sulphanilamide. The patient, aged thirty-eight years, had typical symptoms and signs of the disease, and two positive blood cultures revealed *Streptococcus viridans*. She was treated with sulphanilamide, treatment being commenced one month after the diagnosis had been thus confirmed. Four grammes were given on the first day, 2·6 grammes daily for the next two days, then 1·3 to 2·0 grammes daily for three months. Anorexia and vomiting made it necessary to stop the drug for a day on three occasions. The temperature gradually declined and symptoms lessened. The dose was decreased to 1·0 to 1·3 grammes daily for the next two months. Since November, 1938, the patient has been free from fever and symptoms; the heart murmurs have disappeared and the patient has lived a normal life. The author attributes the result to the long-continued small doses of sulphanilamide. There were no serious toxic effects of the drug at any time.

Carbohydrate Metabolism in Hyperthyreoidism.

T. L. ALTHAUSEN (*The Journal of the American Medical Association*, July 13, 1940) discusses the nature and management of the disturbance of carbohydrate metabolism in hyperthyreoidism. He states that a significant disturbance of carbohydrate metabolism has long been recognized in many patients with hyperthyreoidism, that it is manifested principally by glycosuria, postprandial hyperglycæmia and impaired dextrose tolerance, and that it suggests the presence of *diabetes mellitus*. The author states that the capacity of the tissues to utilize sugar in diabetes is reduced, whereas experimental evidence has shown that in hyperthyreoidism it is notably increased. He refers to the various opinions that have been offered concerning the nature of the disturbance of carbohydrate metabolism in the hyperthyreoid state, including pancreatic dysfunction, inhibition of the peripheral action of insulin, abnormal mobilization of hepatic glycogen by adrenal stimulation, a primary increase in hepatic glycogenolysis, the inability of the liver to store glycogen because of the toxic effects of thyroxine, increased oxidation of carbohydrates in the tissues leading to a secondary exhaustion of glycogen reserves, and the toxic effect of thyroxine on the islet tissue of the pancreas. The author states that he has shown by experimental evidence on rats that the administration of thyroxine has a pronounced accelerating influence on the intestinal absorption of utilizable sugars and starch, and conversely that thyreoidectomy results in considerable slowing of the absorption of dextrose from the intestine. He is of the opinion that all peculiarities of carbohydrate metabolism in hyperthyreoidism are explained satisfactorily by abnormally rapid intestinal absorption of sugars and starch, combined with increased utilization of dextrose by the tissues resulting in depletion of glycogen stores. Increased absorption of carbohydrates accounts for the "diabetic" manifestations of glycosuria, the postprandial hyperglycæmia and the high dextrose tolerance curves, and the chronic depletion of glycogen stores explains the low fasting respiratory quotient leading to a compensatory acceleration of fat catabolism which results in incomplete oxidation of fatty acids and acidosis. The author indicates that in a patient suffering from hyperthyreoidism and suspected of diabetes the simple and in most cases decisive differential evidence is the fasting blood sugar, which is high in diabetes and normal as a rule in hyperthyreoidism. The presence of glycosuria, postprandial hyperglycæmia or high dextrose tolerance curves in patients with hyperthyreoidism does not indicate the presence of diabetes and can be disregarded unless a high fasting blood sugar is also present; and all patients with hyperthyreoidism should receive a high caloric diet with an abundance of carbohydrates to compensate for the rapidity of intestinal absorption and

increased utilization of dextrose in the tissues. Patients with hyperthyreoidism should not be subjected to fasting because they have a tendency to acidosis, which often develops after relatively short periods of abstinence from food. Intravenous administration of dextrose just before, during and after operations to patients with hyperthyreoidism is valuable in lowering the operative mortality. The insulinogenic mechanism of patients with hyperthyreoidism who have true *diabetes mellitus* should be protected as much as possible from the sudden influx of large amounts of sugars after meals, and this is accomplished by replacing sugars from the high carbohydrate diet with the more slowly absorbed starch and the adequate administration of insulin. The author also states that the usual very low dextrose tolerance curves in patients with myxœdema is not due to an increased utilization of dextrose, but to diminished absorption and utilization, which are rapidly and effectively corrected by the administration of adequate amounts of thyreoid substance.

SURGERY.

Carbohydrate Metabolism in Thyreotoxicosis.

E. E. BLANCK (*Surgery, Gynecology and Obstetrics*, August, 1940) reports the findings of an experimental study of carbohydrate metabolism in thyreotoxicosis carried out on rabbits carefully selected and fed with thyreoid substances after a period of normal feeding under careful control. The main object of the experiment was to determine how an excess of thyreoid secretion affects metabolism. Charts are reproduced illustrating changes in appetite, the effect of a single massive dose and changes in hepatic store of glycogen in relation to dosage and period of administration. One of the findings was that the increase in appetite was never sufficient to counterbalance the augmented metabolism.

Gas Gangrene.

URBAN MAES (*Archives of Surgery*, August, 1940) writes of gas gangrene with special reference to the source of contamination and to treatment. It was noticed that contamination of wounds with woollen clothing was frequently followed by gas gangrene. The excreta of animals was known to contain gas-producing organisms, and it was thought that sheep's wool might become contaminated with spores. Cultural experiments were therefore carried out on samples of woollen cloth obtained from a manufacturer's catalogue. Half the samples were dry-cleaned and steam-pressed, and the other half were used untreated. As controls, samples of cotton, rayon, linen and silk materials obtained from a similar catalogue were incubated. None of these contained any wool. From eleven out of twelve of the woollen samples Gram-positive spore-bearing anaerobic gas-forming bacilli, morphologically compatible with the members of the *Clostridium* group were grown. After the cleaning process the results were virtually the same. Such organisms were not grown from any of the control substances not containing wool. Treatment depends primarily on early diagnosis. Local swelling in a wound, the characteristic odour, the changes in skin colour and the marked deterioration in the general condition of the patient should lead to suspicion. Cultures should be made, but treatment should not await the results. Prophylactic and therapeutic use of serum is advised. X rays may have a place in prophylactic treatment of dirty wounds. The work of Kelly and others seems to have established the usefulness of X-ray treatment as a therapeutic measure. In view of this it is possible that mutilating amputations and extensive incisions may in future be avoided; but the author himself still thinks that amputation may be advisable in some infections, especially in the lower part of the leg, as there is a pause in the spread of the process when it reaches the region of the knee. Sulphanilamide should be used, because, even if it does not control the specific infection, it may control the ordinary pyogenic organisms which, by utilizing the oxygen of the tissues, assist the anaerobes to flourish.

The Absorption of Sulphanilamide from the Large Intestine.

R. TURELL, A. W. M. MARIUS AND L. NERB (*Annals of Surgery*, September, 1940) present the results of experimental studies of the absorption of sulphanilamide from the large bowel. The drug was administered either in warm (30° C.) 1% solution or in the form of suppositories made up with gelatine and glycerine. When the 1% solution was used absorption of the drug was satisfactory and concentrations in the blood of up to 14 and 15 milligrammes per 100 cubic centimetres were observed. Subsequent examinations of the rectal and colonic mucosa showed no untoward effects. The absorption of sulphanilamide from suppositories was much less satisfactory. The authors consider that rectal administration of the drug may be of value when the oral route cannot be utilized.

Oxygen Ventilation in Tuberculosis of the Bladder.

W. J. KETZ (*The American Journal of Surgery*, August, 1940) describes the results of oxygen ventilation in the treatment of tuberculosis of the bladder. He insists that the condition is essentially secondary to a focus elsewhere in the genito-urinary tract, most often in the kidney or prostate, and that symptoms usually abate if the primary focus is successfully attacked. Local treatment of the bladder is indicated if symptoms do not subside in six months. The author reports two cases in which a "rebellious" cystitis followed nephrectomy and ureterectomy for renal tuberculosis, and in which rapid improvement followed oxygen ventilation of the bladder. The organ was emptied by a catheter and repeatedly filled with pure oxygen. The procedure was repeated at weekly intervals and progress was controlled by cystoscopic and bacteriological examinations.

Mixed Parotid Tumours.

D. H. PATEY (*The British Journal of Surgery*, July, 1940) discusses the treatment of "mixed" tumours of the parotid gland. He reviews the literature and recalls cases from the records of the Middlesex Hospital in an endeavour to investigate the course pursued by untreated parotid tumours; he concludes that there are wide variations in the rate of growth of different tumours and of the same tumour at different times. As regards spontaneous malignant change in the tumours, the author considers that its occurrence is so rare as to be negligible, so that while an untouched mixed parotid tumour will gradually increase in size and may eventually cause most unpleasant deformity, the chance that death may be caused by the tumour is slight. The author then proceeds to show that while surgical interference may cure the condition, it does not succeed in eradicating the disease and the patient runs an increased risk of a fatal result. The fundamental difficulty in the treatment of parotid tumours depends on a combination of anatomical and pathological factors. The anatomical problem is due to the position and relations of the parotid gland, and particularly to its relation to the facial nerve. The pathological difficulty is due to the presence of tumour cells outside the main tumour mass; these may be present even in those tumours which appear macroscopically to be completely encapsulated. The author points out that there are three possible lines of treatment. First, the tumour may be left undisturbed to follow its natural course, which has already been discussed. Secondly, an operation may be performed which removes not only the obvious tumour, but also any surrounding seedlings. Thirdly, the main tumour may be enucleated and the potential seedlings dealt with by other means. The first method has obvious disadvantages, and in the second an adequately radical operation involves the sacrifice of some or all of the branches of the facial nerve. (The author rejects the method of simple enucleation as leading to too high a percentage of recurrences.) The conclusion is reached that enucleation together with external or internal irradiation is the best active treatment. It is suggested that there should be no hurry to treat these tumours and that a period of observation to determine the rate of growth may be advantageous. In slowly growing tumours and in those appearing late in life the correct treatment may be to do nothing.

Gangrene of the Skin.

I. H. BRODIE AND C. BOUCK (*The Canadian Medical Association Journal*, August, 1940) describe progressive postoperative gangrene of the skin. It usually follows operations for appendiceal abscess, perforated duodenal ulcer or thoracic empyema. It affects only the skin, the muscles being spared. It begins as a redness and œdema with burning pain adjacent to the incision. The skin becomes blue, and in two or three weeks sloughs separate, leaving a granulating area surrounded by an irregular spreading gangrenous edge, and beyond this a zone of tender induration and congestion. The condition spreads, and Robert Hutchison has reported a case in which the ulcer area eventually extended from occiput to ilium and involved the whole anterior wall surface. The condition appears to be due to an anaerobic streptococcus associated with a hæmolytic staphylococcus. Vessels are not thrombosed. Treatment recommended is wide excision beyond the outer zone of congestion and the application of a particular brand of zinc peroxide cream. Later, skin grafting may be necessary. Chemotherapy may be of use, especially sulphathiazol.

Special Articles on Psychiatry in General Practice.

(Contributed by request.)

XXV.

ON THERAPEUTIC JUDGEMENT AND ALLIED PROBLEMS.

THERAPEUTIC judgement in a sense involves the whole of psychiatric knowledge. It involves our entire experience, and as our education ceases only with the grave, it must forever be imperfect. Carlyle, when he wrote "school hours are all the days and nights of our existence", inferred that none of us can hope to wear the mantle of infallibility. Even at the risk of wearisome repetition it must be stated that the peculiar difficulty in psychiatry lies in its immensity. The only approach is from the psycho-biological angle, and this implies a conception of our patients from the psychic, the physical and the environmental aspects. The complexity of the factors creates our difficulty. If we neglect one, our therapeutic judgement is imperfect. Whilst it is obviously impossible to review all the factors, there are some which call for special mention.

The Time Factor.

The question of time weaves an unmistakable pattern in every problem of psychiatry. Nervous conditioning is a slow process. Morbid symptoms may commence in childhood only to blossom in adulthood. As a result one must learn to think not in terms of days, but in months, years or even decades. Often the most important information given to the patient is not that he will be cured, but that his cure will take years and that he will continue to improve until death cries *finis* to his endeavour. It is an axiom that the longer the duration, the worse is the prognosis.

The First Symptom.

The informed physician will not pass an opinion until he learns the nature of the first symptom of abnormality. Often it is not sufficient to ask the patient. He must cautiously interview parents, other relatives and possibly friends. Whilst the obvious symptom may be a matter only of days from inception, there may have been subtle changes occurring months previously. Often the diagnosis, the prognosis and the treatment will depend not on the florid pattern of today, but on the vague traces of forgotten trends.

Searching into Childhood.

Whenever possible it is advisable to find out something of the childhood history. A late age for sitting erect, walking and talking suggests mental deficiency. Low school grades indicate some mental retardation; seclusiveness, inability to make friends, disinterest in the opposite sex are pointers to the schizophrenic diathesis. Moodiness may give a clue to manic-depressive trends.

Cooperability.

Cooperability is a vital factor in all psycho-therapeutic procedures. It involves not merely the patient's insight and his will to cooperate; there are friends, relations, business acquaintances, facilities for work *et cetera* to be considered. If this was a perfect world and the physician was a dictator, there would be cures of many of the hopeless invalids who in this imperfect world are doomed to ill health. One must make the best of the opportunities that are available, and we must be careful to advise only those that are available. Suggestion of treatment which is unobtainable has often sounded the death knell to therapeutic hopes.

The patient's financial status is of great importance in this connexion. It should be assessed prior to the discussion on treatment. If an expensive period of stay in hospital or a long psychoanalytic procedure is economically impossible, they should not be mentioned as alternatives, since their inaccessibility will slam the door on hope of recovery. In psychiatry there are usually many lines of treatment as alternative routes to health.

Is there Dementia?

Dementia is regarded as a stage of irreversible cerebral morbidity from which complete recovery is impossible. Its importance from the prognostic angle must be emphasized. In actual practice its diagnosis is often difficult. Sometimes the unexpected happens; but true dementia may be suspected when over a long period of time there has been a steady deterioration of the mental faculties.

When is a Case Hopeless?

If we omit those cases in which indubitable dementia has occurred, it is difficult to say that a case is hopeless. Recently we saw after the lapse of years two patients who had been the psychiatrist's nightmares. They exhibited long-continued anxiety states. Psychotherapy mitigated but failed to produce even the semblance of a cure. Today they are happy women. One has found a lover, the other a congenial occupation. Our role is to maintain an attitude of hopefulness, load the scales and trust that circumstance will eventually aid our endeavours. In other words, our judgement must always be tinged by optimism. This is the lesson which can be learned from the quacks. They succeed because they rely on the twin therapeutic deities—optimism and time.

When to Consult a Specialist.

The general practitioner merits our sympathy. His field is the immense range of medicine, midwifery and surgery. He must live. He must preserve that real but intangible element, so aptly described as "face". Prestige must be maintained. Patients are ignorant mortals who are only too ready to maintain that caution is due to crass ignorance. On the slightest pretext they will not merely take their patronage to a rival, but will also induce their friends to do likewise. The practitioner also is mortal. He has treated a patient for weeks or months and does not entertain with pleasure a prospect of being shown to have been wrong in his opinions. The problem of "face" is to be considered, the possible loss of standing in the eyes not merely of a medical colleague, but also of the patient, relations and friends. It is apparent that a consultation is not a decision to be lightly undertaken. Medicine may be a science; it is also an art, and this embraces the art of maintaining prestige and livelihood. This frank discussion is justifiable, since it surrounds a very vital problem of when to obtain advice on difficult problems. It can be solved only when the specialist appreciates the practitioner's point of view. It is essential that whilst giving unbiased advice for the patient's welfare he takes adequate measures for maintaining the prestige of the general practitioner. At the same time the specialist must clearly visualize the difficulties of the practitioner—that he is a field worker in medicine and must therefore attack a myriad difficult problems under conditions of material and time handicaps. The problem will be satisfactorily solved only when practitioner and specialist learn to work together in the harmony of equality. Both are essential. They are complementary and each can reinforce the prestige of the other. The only difference is that one works on a narrow, the other on a broad field. Both will make mistakes and neither has the quality of omniscience. It may be said that such an ideal state of affairs does not exist. Whilst this may be true, at least as an axiom of judgement, it should be possible for the practitioner to know personally his consultant and for the latter to be aware of the former's difficulties. Under existing conditions such a course is difficult; but this is an era of change. It is certain that in the not far distant future a licence to practise medicine will entail compulsory post-graduate training every two or three years. This is the only method whereby the practitioner and the specialist can be made to keep in step with the march of progress. Not merely will it create the bridge between specialism and general practice, it will raise medical standards to one which conforms more closely to the ideal. As a matter of judgement we should not merely realize the need but take practical steps towards its accomplishment.

The following criteria are of utility in the realm of practical politics:

1. Obtain another opinion when your patient's condition is stationary.

2. Seek further advice when you are bored with your case. This needs little comment. The patient is usually only too aware of the doctor's attitude. That you are bored is almost tantamount to saying that he appreciates your mental attitude.

3. Consider consultation when you have seen your patient so frequently that you are psychologically blind to the details. Whilst the criteria need no comments, psychological blindness is perhaps not so obvious. Just as domestic deafness often occurs between husband and wife, so therapeutic blindness occurs between patient and doctor. The symptoms have been so frequently and exactly pigeon-holed, there is no room for an alternate view to enter the mental horizon. When this occurs, another opinion may pave the way to a rapid success.

4. It is time for another opinion when you sense repressions but cannot elucidate them. The general practitioner possesses certain advantages. He is familiar with the patient's environment, his relatives, his friends and his work. He is the trusted recipient of family secrets. Not infrequently, however, this role of friendly familiarity defeats the role of psychiatrist. The patient suffers from psychological traumata, masturbation, amorous indiscretions, family antagonisms *et cetera*. He fears to tell his medical adviser because the role of intimate friend makes him bashful or he fears that it will lead to discussion with other members of his family. His defence is therefore silence. Paradoxically enough, he may almost instantly convey the truth to a complete stranger.

5. You may need additional prestige. Every psychiatrist is familiar with the patient who would not trust him with the treatment of his cough or a cut finger. They regard him as an ignoramus in the art of general medicine. He lacks prestige. Many psychological problems, such as fear of insanity, suicide or homicide *et cetera*, are regarded as beyond the scope of the general practitioner. When they occur and are not soon dispelled by a frank discussion, it is wise to appeal to one who is regarded as a specialist in these disorders. It is well to remember that your own prestige as a reliable practitioner will be enhanced by the patient's appreciation of your understanding of limitations.

6. The "Cardiazol" problem. When Meduna made his momentous discovery of the remedial action of induced epileptiform convulsions he introduced a new problem in psychiatric judgement. General practitioners are employing this method of treatment. It is, however, very questionable whether this widespread use is in the best interest of the majority of the patients. Although in principle the treatment is easy, there are practical difficulties which may be briefly summarized: (i) Skill in giving unfailingly rapid injections can be obtained only by frequent practice. Failure to achieve convulsions is deleterious to the patient. It provokes relapses and fear, and automatically leads to the cessation of treatment. (ii) Dislocations, fractures, cardiac damage, mental deterioration and death are distinct possibilities. These create a medico-legal responsibility. (iii) "Cardiazol" treatment is but one link in the course of treatment. There remains the necessity of adjusting the patient's personality to his environment. "Cardiazol" cleans the slate, but the lesson of life must proceed. Unless adequate adjustments are made the morbid relationships which led to the maladaptation will recur. (iv) "Cardiazol" is not an omnibus therapy. In certain cases there are definite contraindications whose recognition depends not merely on the physical, but also on the psychological state, and this requires accurate judgement. The case for "Cardiazol" may perhaps be best phrased by quoting a parallel. The routine removal of the vermiform appendix is easy. Would it be justifiable for a psychiatrist occasionally to remove this organ? Doubtless he would have some successes, but the possible complications render it highly inadvisable.

Conclusion.

The primary aim of this series of articles is to simplify psychiatry. In this review of the factors underlying therapeutic judgement there is more than a hint of underlying difficulties. Few subjects can be simplified to the basis of an arithmetical formula. Difficulties are inherent. None the less, the practitioner who recognizes general principles and the limits of his own infallibility, will achieve a marked success in treatment. The timely recognition of the relatively few cases which are outside the ambit of his experience will redound to his skill as a diagnostician and fortify his prestige.

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British Medical Association News.

SCIENTIFIC.

A MEETING of the New South Wales Branch of the British Medical Association was held on October 31, 1940, at the Robert H. Todd Assembly Hall, 135, Macquarie Street, Sydney, PROFESSOR W. K. INGLIS, the President, in the chair.

Acute Conditions of the Abdomen in Childhood.

DR. P. L. HIPSLEY read a paper entitled "Acute Conditions of the Abdomen in Childhood" (see page 651).

DR. HOWARD BULLOCK paid a tribute to the work of Dr. P. L. Hipsley, which was known all over the world. He said that he (Dr. Bullock) represented a hospital with an age limit of three years, so that it was necessary in diagnosis to rely on the information given by the patient's mother and on observation. Dr. Hipsley was speaking as a surgeon with a vast knowledge of abdominal surgery. One remarkable point in Dr. Hipsley's paper was his reference to children suffering from pelvic appendicitis, which in his experience often remained undiagnosed until the seventh day; it was a grave reflection on them all. Dr. Bullock thought that insufficient attention was paid to surgery in children; the frequent deaths of children from appendicitis should be investigated. Dr. Bullock had made a few inquiries from Mr. Carver, the State statistician, concerning statistics, and had found that children aged under one year were dying from appendicitis, and every year approximately thirty children, aged up to ten years, died in New South Wales from the disease. This was a serious matter, and Dr. Bullock was glad that Dr. Hipsley had laid stress on it. Dr. Bullock said that he had always been interested in intussusception. If the Hipsley treatment was continued for long enough, the intussusception would be reduced; but the average surgeon did not feel competent to say whether the intussusception was reduced or not. Benefiting from Hipsley's researches, Dr. Bullock used fluid under slight pressure and then operated. The fluid so used unravelled most of the intussusception and minimized the amount of handling of bowel necessary to reduce the intussusception. When the intussusception was reduced by Hipsley's method and the abdomen was not opened, there was one weak point; the bowel might have been perforated and a valuable life lost, as Dr. Hipsley had courageously pointed out in his statistics. Dr. Hipsley had said that he had found it necessary occasionally to operate after the injection method had been tried and failed, and his figures had shown that the mortality rate in these circumstances was quite high, which demonstrated that reduction without operation was the ideal to be aimed at.

The diagnosis of appendicitis in babies was not easy: there were such bugbears, amongst many others, as "green apple appendicitis" and gastric influenza. It was advisable in the latter complaint to inquire whether any member of the patient's family was suffering from influenza. Moreover, the specific fevers at their onset sometimes simulated appendicitis. Abdominal pain in childhood due to pancreatitis associated with mumps could be very worrying. Dr. Bullock had never seen Meckel's diverticulitis in children, but he had seen the condition in adults. Another interesting point in Dr. Hipsley's paper, with which Dr. Bullock was in agreement, was that hernia in children did become strangulated, though many authorities said true strangulation was rare. The condition was met in very young children. When Dr. Bullock was a resident medical officer at the Evelina Hospital for Children in London in 1912, two cases of strangulated hernia in children three weeks old occurred in three days. Dr. Bullock went on to say that in acute lesions of the abdomen it should be remembered that it was wrong to open the abdomen before every endeavour had been made to localize the lesion, and no abdomen should be opened unless a thorough examination of the urine had been carried out. In intussusception Dr. Hipsley recommended exteriorization in those cases in which reduction was impossible; Dr. Bullock noticed that the recommendation was not that the ileum and the colon should be united. That was a procedure carried out on one occasion by Dr. Bullock with success and reported in THE MEDICAL JOURNAL OF AUSTRALIA of July 17, 1920, and was considered then by experienced surgeons a risky procedure. In conclusion Dr. Bullock once more expressed his appreciation of Dr. Hipsley's paper.

DR. E. H. M. STEPHEN said that as a physician he had nothing to say on this purely surgical subject. However, he wished to endorse Dr. Hipsley's instructions that the history given by the mother should be listened to carefully. Nothing in this world was so delightful or so well deserved as Dr. Hipsley's tribute to mothers. It was impossible to spend too much time in taking the child's history from the parent. When one remembered that surgeons were impatient people, and that in spite of this they found it wise to be so patient, there was a lesson to be learned. Dr. Stephen was filled with admiration at the way in which Dr. Hipsley had placed his subject before the meeting; it was logical, clear, proved by pictures and decorated by slides. By reading it through again they would be able to keep their knowledge of the subject fresh and their sensibilities fully alive to the various conditions causing "the acute abdomen" in childhood.

DR. DONALD VICKERY commented on a case referred to by Dr. Hipsley. This patient had had nephrosis and pneumococcal peritonitis and was treated by sulphanilamide and repeated abdominal puncture. Dr. Vickery had had an opportunity of seeing the child about three weeks before the meeting; all the tests for nephrosis were made. The urine was completely free from albumin, and its specific gravity was about 1,020; this was a good finding in subacute nephritis or nephrosis. The cholesterol and urea contents of the blood were within normal limits. In view of the successful outcome of this case, and as a large proportion of "nephrosis" patients contracted pneumococcal peritonitis, it appeared that "nephrosis" was a response by the kidney to pneumococcal toxin rather than to streptococcal toxin, in which case no recovery at all would occur.

DR. E. S. STUCKEY asked Dr. Hipsley if he could say, from his records of young children suffering from intussusception, what proportion had to have exteriorization and resection, and whether many had recovered.

DR. B. T. EDYE said that his experience was limited to older children and that he had had little experience with infants. He would have liked to hear Dr. Hipsley's views regarding the treatment of the post-operative complications of appendicitis, such as peritonitis, pelvic abscess and intestinal obstruction. No doubt Dr. Hipsley was frequently called in consultation to patients suffering from these conditions, which might be due to the advanced state of the disease at the time of operation or to lack of judgement or experience on the part of the surgeon who operated. When a child failed to progress well after operation and the advice of a consultant was sought, it was his duty to assist to overcome the difficulty. Dr. Edye thought that some reference to this aspect of the subject would be very helpful to readers of Dr. Hipsley's paper when published.

Dr. Edye was glad Dr. Hipsley had referred to the fact that children who had recurrent pain in the abdomen were suffering not infrequently from appendicitis. Often no abnormality was discoverable on careful and repeated investigation; but Dr. Edye, during the years he was an out-patient surgeon at the Royal Prince Alfred Hospital, formed the habit of recommending these children for appendicectomy, and he was sure many were saved from acute appendicitis later.

Dr. Edye then referred to Dr. Hipsley's remarks concerning the Ochsner-Sherren treatment. He said that he had often felt the treatment to be inadvisable even for adults, and possibly dangerous unless the doctor could be in constant attendance. With regard to intussusception, Dr. Edye mentioned that some years earlier a new journal devoted to surgery was inaugurated in the United States of America, and the first paper in the first issue was one on intussusception by Dr. Hipsley. That was a very great compliment and indicated that Dr. Hipsley was regarded as one of the world's leading authorities on this subject.

DR. H. C. R. DARLING said that the subject was rather out of his line, as by the time the patients came into his hands they were considerably older. He had attended the meeting knowing Dr. Hipsley's eminent position with regard to the surgery of childhood; he had listened to his paper with great appreciation, knowing full well that there were in it several morsels that could be digested with profit. He was interested in Dr. Hipsley's pithy remarks about the diagnosis of appendicitis. Dr. Darling then referred to the question of the examination of the urine. Although it was a good rule that this should be done, Dr. Hipsley had wisely pointed out that the presence of blood or pus in the urine might not be the final solution of the problem. Dr. Darling had been tricked once. A child, aged about fourteen years, climbed a tree and suffered severe pain in the right side of the abdomen. As the examination was conducted during the "latent period", there were very few abnormal signs except a raised pulse rate. Examination of the urine disclosed blood, and Dr. Darling believed that the child was suffering from a renal lesion. Later on, the original medical attendant saw the child again and suggested that it would be wise for Dr. Darling to reexamine him. Dr. Darling saw the child early the next morning. The child had a duodenal ulcer that had leaked into Rutherford Morion's pouch.

The next point in Dr. Hipsley's paper to which Dr. Darling referred was pneumococcal peritonitis. Apart from cases associated with nephrosis, Dr. Darling had noticed that there were three cases associated with or secondary to pneumonia, three male patients and three deaths. Dr. Darling wondered whether the three males were the patients who died, and whether they were the three who had suffered from lobar pneumonia. With regard to the various abnormalities in rotation of the bowel, Dr. Darling was thankful to say that the general surgeons who dealt with adults found them conspicuous by their absence; but Meckel's diverticulum appeared every four or five years. One of the other speakers had mentioned that in his experience he had not encountered the former condition; Dr. Darling wondered what happened to all the people who had these conditions in childhood; the abnormalities were not common, but they were by no means unknown at the Royal Alexandra Hospital for Children. They were very rare in adults, but Meckel's diverticulum was not infrequent. In conclusion, Dr. Darling again expressed his appreciation of Dr. Hipsley's illuminating paper.

DR. GEORGE BARRON also thanked Dr. Hipsley for his paper. When they had the experience of such a man the subject under discussion sounded very easy; but when these conditions had to be actually dealt with, when the children had abdominal pain and vomiting, the matter was not so easy. On one occasion Dr. Barron looked after a small child who appeared to have acute gastritis and enteritis; it was not until about three days afterwards, when the child got an acute abdominal pain, that Dr. Barron realized that the child had acute appendicitis; he operated, but it was too late. The youngest child on whom he had operated was aged about eighteen months. Dr. Barron said that transposition of the bowel was not often encountered; he had come across the condition once, in the young son of a medical practitioner, when he was operating for appendicitis. However, the appendix was found on the left side and successfully removed, and the child recovered.

DR. C. H. WESLEY thanked Dr. Hipsley for his interesting paper. He said that at the Harvard Children's Hospital the surgeons were very interested in Dr. Hipsley's work on intussusception and in his statistics; but Professor Ladd and his colleagues still operated on patients suffering from intussusception. At the Detroit Children's Hospital, the hospital at which the tannic treatment for burns was first worked out, the Ochsner-Sherren treatment for appendicitis was used, but Dr. Wesley did not see any statistics.

Dr. Hipsley, in reply, thanked those present for the way in which they had received his paper. He said that he had been interested to hear Dr. Bullock mention pancreatitis as a possible cause of abdominal pain; he always had doubts about pancreatitis being associated with mumps and causing abdominal pain. Some years earlier he had a young relative who was being attended by three medical men in partnership; the child was aged nine years. He had mumps and they were treating him for pancreatitis. When Dr. Hipsley saw him the child had a ruptured appendix, and it was too late to save him. Dr. Hipsley then referred to Dr. Bullock's operation for the treatment of intussusception, when he had dealt with the unreduced part by making an anastomosis between the ileum and colon. Dr. Hipsley said that he did not understand why the children treated in this manner recovered, but they did. He thought that a spontaneous reduction must occur afterwards. On occasions he had recommended such a procedure himself. He had had no personal experience of exteriorization of the bowel, though he had recommended it in his paper as a method which might be used in certain cases. He had had a case in which recovery occurred after resection and anastomosis, but it was known that very few children recovered when resection was done under twelve months. It was obviously the correct method of treatment if the children could stand it. Dr. Hipsley considered that more patients would recover when the intussusception had been present for several days if operation was not rushed so much. It was better to spend four or five hours in these cases, giving intravenous infusions of saline solution and glucose before operating. Dr. Edye had asked about complications following operation for appendicitis. Dr. Hipsley said that he had originally put in his paper some of the matters to which Dr. Edye had referred; but he had cut them out on account of the length of the paper. He had always thought that far more children and adults died after removal of an apparently normal appendix than after the removal of a gangrenous one. He had encountered many cases in consultation in which an abscess had followed the removal of an apparently healthy appendix, and he was sure that Dr. Edye saw many such cases also. He thought that something was wrong with the technique which was usually used. Possibly Dr. Edye had in mind, when referring to certain post-operative complications of appendicectomy, the not uncommon occurrence of pelvic abscess. Dr. Hipsley thought that in children it was safer to open such abscesses from above rather than into the rectum. He had seen a patient recently in whom a recto-vaginal fistula had followed the opening of a pelvic abscess into the rectum. Dr. Hipsley thought that the technique which he had seen the late Sir Charles Clubbe use on occasions, was probably an improvement on the technique usually employed. The late Sir Charles Clubbe used to reflect a cuff of peritoneum from the base of the appendix before applying the ligature to the stump; the cuff of reflected peritoneum was then brought together over the end of the stump before the pursestring suture was

completed; so that two layers of peritoneum lay between the infected stump of the appendix and the peritoneal cavity. Dr. Hipsley considered that an abscess was likely to develop unless hæmostasis was complete. Dr. Bullock had expressed surprise at Dr. Hipsley's statement that in certain cases the diagnosis of appendicitis was not made for five or six days; Dr. Hipsley was referring particularly to the pelvic appendix. He had time and again seen cases of pelvic appendicitis remain undiagnosed for five or six days because no abdominal rigidity or tenderness was present and because no rectal examination had been made.

PROFESSOR W. K. INGLIS, from the chair, said that he was glad to see so many young members of the profession present to hear the subject presented in such an attractive way. They had heard Dr. Hipsley refer to Sir Charles Clubbe; what Clubbe was to Dr. Hipsley, Sir Alexander McCormick was to Dr. Edye, and Professor Welsh (his predecessor) was to Professor Inglis. Experience over long periods of time with men like these was the greatest education of all and could not be got from books. Those present were indebted to Dr. Hipsley for having used his vast experience and the records of the hospital, which were very well adapted for this purpose. Professor Inglis felt that the younger members present would profit very much from the address.

Medical Societies.

MELBOURNE PÆDIATRIC SOCIETY.

A MEETING of the Melbourne Pædiatric Society was held at the Children's Hospital, Carlton, on August 14, 1940, DR. H. DOUGLAS STEPHENS, the President, in the chair.

Hammock Splint for Scoliosis.

DR. E. E. PRICE showed a small series of patients to illustrate the construction and uses of a hammock splint which he had designed to aid in the management of incipient scoliosis. He said that the splint consisted essentially of a slack canvas sling supported from two horizontal parallel bars mounted on a frame. The head, shoulders and buttocks of the patient were supported in the longitudinal trough thus provided. The object of the splint was not immobilization, since sufficient restraint was obtained by means of groin straps and a pectoral shield; and for children past babyhood arm and leg pieces were added similar to those in use for poliomyelitis. The body and head slings were separated at the level of the shoulders, which were supported on a padded platform. The height of that platform determined the level of the patient, all the other parts being adjusted accordingly.

Dr. Price explained that a number of principles were embodied in the construction of the splint; he referred to recumbency, automatic alignment, freedom of movement and selective pressure. Recumbency was provided for by means of the sling and the restraining straps, which eliminated any harmful effect of gravity; the patient lay in a comfortable bassinet. Automatic alignment was attained because the bottom of the trough formed a straight line, and the spine of any patient lying in the trough would tend to straighten in the antero-posterior plane. If for any reason a part of the spine was not in that plane it would not be at the bottom of the trough; but the action of gravity would automatically return it to the median plane. That action would most certainly be exerted on the bulkier parts—the head, shoulders and buttocks; and by that means those three cardinal points would always be brought back to alignment on movement. Immobilization was avoided in the splint; the patient could wriggle into any position within the limits of the sling and the restraining straps, but when that voluntary effort was expended he was returned to the straight position. Selective pressure was exerted, as any backward rotation of the ribs would be resisted by constant pressure of the canvas.

DR. J. G. WHITAKER said that as Dr. Price had been too modest to say so, he would like to direct attention to the fact that Dr. Price's hammock idea was original. Dr. Whitaker asked Dr. Price for further information as to what was to happen when the child became ambulatory, and said that he would also like to know whether Dr. Price had had experience of the use of the apparatus for scoliosis of the "fixed" type. He added that the method was certainly a pleasant one to use as an aid in controlling a very unsatisfactory orthopædic condition.

DR. WILFRED FORSTER thanked Dr. Price for what he regarded as a useful innovation; the method provided an ideal bed for anyone with scoliosis.

Dr. Price said that his demonstration was in the nature of a preliminary report; the oldest splint was barely a year old. At that stage he was not in a position to express an opinion as to the value of the method for older patients. Originally he had intended to use the apparatus only in an attempt to arrest the progress of the scoliosis, and had not thought that it would be curative; he had used the word "management" advisedly. His aim had been to keep the head, shoulders and buttocks in a straight line.

Megacolon.

DR. W. W. MCLAREN showed a baby boy, aged one year, who had been born two months prematurely because his mother had "kidney trouble". An older brother was alive and well. Dr. McLaren said that the patient began to lose ground when he was six weeks old, and later he had had intermittent attacks of abdominal distension and constipation. He was naturally fed for three months only, and afterwards was artificially fed with whey-milk mixtures and later diluted condensed milk. At the age of seven months he was admitted to hospital with the provisional diagnosis of malnutrition and umbilical hernia. At that stage he was very small and wasted, and the skull was malformed; the abdomen was tensely distended; the maximal impulse of the heart and the superficial area of cardiac dulness were not noticeably abnormal in position; and an umbilical hernia was present. While in the hospital the baby contracted bronchopneumonia and rubella; because of the persistence of fever and bronchitis he was discharged from hospital without operative repair of the hernia.

He was readmitted to hospital at the age of eleven months with severe bronchopneumonia. After a very stormy three weeks and repeated courses of sulphapyridine treatment the temperature ultimately came down and the chest signs disappeared. From skiagrams of the chest it was seen that the outline of the heart was unusual. Radiological investigation of the abdomen resulted in the discovery of gross dilatation of the colon, particularly of the transverse portion. Dr. McLaren said that no congenital heart anomaly was present, but the underlying pathological condition was megacolon. He wondered whether the peculiar outline of the heart in the later skiagrams could be attributed to the great distension of the transverse colon.

DR. A. G. VILLIERS said that she regarded the shape of the heart as an anatomical anomaly which was not indicative of any specific type of congenital malformation.

DR. H. J. SINN said that in discussing the case with Dr. Hallam he had gained the impression that the outline of the heart was determined by the distension of the bowel. While he admitted that the diagnosis of megacolon was a likely one, he considered that cœliac disease had to be kept in mind, as the child was dwarfed and emaciated and had very small buttocks.

DR. K. H. HALLAM said that in radiological examination for congenital heart disease in childhood there was usually no indication in the films of the internal strife that was taking place, even if the condition was a lethal one. He added that it was extremely difficult to get direct postero-anterior, antero-posterior or true lateral films, and deviations from those positions might give extraordinary outlines. At times the separate leaves of the diaphragm appeared in silhouette, the state of the respiratory distension of the lungs filled with air allowing the ventricular edge to show up abnormally. After military experience in the interpretation of miniature films, Dr. Hallam felt that he must be very wary indeed in coming to any conclusion about the actual condition of the heart from the radiological appearances.

Scurvy at an Unusually Early Age.

DR. JOHN COLEBATCH showed a baby girl, aged one year, who was admitted to hospital at the age of three months with a provisional diagnosis of anæmia and purpura; she was in the care of Dr. J. W. Grieve, to whom Dr. Colebatch was grateful for permission to show her at that meeting. She was the eleventh child in the family, and was said to have been born at full term, though her birth weight was only four pounds two ounces. At the age of four weeks she had had a coryzal attack followed by a crop of little red spots on the body lasting only a few days. Two weeks later she had had another cold, followed by what appeared to be papular urticaria. It was then observed that she was pale. In another two weeks the mother had noted that the baby bruised easily over the ribs when lifted up, and that a week later she passed some loose motions the colour of coffee grounds. From that time she had lost weight, the pallor had increased and the red spots on the limbs had returned. During the few days immediately prior to her admission to hospital she had been listless, had vomited freely and was restless at night. The mother

mentioned that she herself had had several epistaxes, bleeding excessively after tooth extractions, that she bruised easily even after hypodermic injections, and that she had lost a lot of blood after the confinement. She stated that her diet in the antenatal period had contained plenty of fruit and vegetables and other protective foods; but those statements were found subsequently to be far from true.

Dr. Colebatch said that on her admission to hospital the infant was very pale, moderately feverish and weighed only seven pounds fourteen ounces. Numerous petechiæ were present over the limbs and on the tongue, with ecchymoses on the trunk; the gums were healthy; the liver and the spleen were each enlarged to approximately four centimetres below the costal margins. The lymphatic glands were readily palpable in the cervical, post-auricular, axillary and inguinal groups, and beading of the ribs was present. The hæmoglobin value was estimated at 42%; the erythrocytes numbered 3,000,000 and the leucocytes 19,000 per cubic millimetre; 14% of the leucocytes were polymorphonuclear cells, 4% were metamyelocytes, 1% were myelocytes, 5% were eosinophile cells, 6% were monocytes, 69% were lymphocytes, and 1% were lymphoblasts; the calculated colour index was 0·7; normoblasts and erythroblasts were present in the films; the bleeding time was seven minutes and the coagulation time was within normal limits. Skiagrams of the chest revealed no abnormality; the blood serum of the patient failed to react to the Wassermann test; the Mantoux test, with old tuberculin in a strength of 1 in 1,000, did not produce a reaction; and examination after a test meal revealed complete achlorhydria. Two days after the child's admission to hospital blood was given by transfusion, as the hæmoglobin value had fallen to 30%. In spite of that, further hæmorrhages had occurred in the conjunctivæ, with ecchymoses and petechiæ all over the body, melena, abdominal distension and pyrexia to 104° F. Dr. Colebatch remarked that the clinical picture was suggestive of the terminal stage of leuchæmia, but that marrow smears had been obtained by sternal puncture in which no evidence of leuchæmia was found; they were, indeed, normal, apart from relative paucity of megakaryocytes. In skiagrams of the long bones Dr. Colebatch was able to find the changes of active scurvy, including subperiosteal hæmorrhages. He went on to say that those findings seemed so incredible in the face of the mother's story that he had made a further inquiry into her dietetic history. The mother had admitted to him that, from self-consciousness at finding herself pregnant at so late an age, she had deliberately dieted herself with the idea of concealing her condition. Her diet had contained no appreciable amount of vitamin *C*, she had only occasionally eaten a fresh apple or some tinned tomato juice, and for years she had not taken any green vegetables. Her tendency to bleed had become apparent only during that pregnancy, and towards the termination she was haggard, pale and dyspnœic on exertion. Dr. Colebatch considered, therefore, that the mother had been moderately scorbutic throughout the pregnancy, that the baby had been born deficient in vitamin *C*, and that the deficiency had been increased when natural feeding was stopped at the age of five weeks.

With reference to treatment, Dr. Colebatch said that blood transfusion had been given on four occasions (20 ounces altogether), and orange juice, ascorbic acid, "Adexolin", "Marmite" and iron had been given. The recovery was tedious, being interrupted by repeated attacks of bronchopneumonia and furunculosis; but after seven months the blood picture had returned to normal, the spleen was no longer palpable, hydrochloric acid had reappeared in the stomach and the child looked well. At the time of the meeting she weighed fourteen and a half pounds. Dr. Colebatch showed in skiagrams of the long bones the healing of the scorbutic condition, and directed attention to the presence of a feature of interest which he said Shipley had described as evidence which remained for months or even years after scurvy; this was the persistence in the epiphyseal ossification centres of a nucleus of scorbutic bone embedded in normal bone of greater density, which was of subsequent development. Dr. Colebatch emphasized, however, that the feature of greatest interest in the case was the extremely early age of onset and the adequate explanation provided by the extraordinary dietetic history of the mother. In conclusion he mentioned that it was also unusual to find the gums so healthy, though it was known that severe scurvy could occur without gingivitis before the eruption of teeth.

DR. H. BOYD GRAHAM expressed interest in the establishment of the diagnosis, and regretted that no information was forthcoming on the ascorbic acid content of the urine.

DR. R. L. FORSYTH drew attention to the illustration of the importance to a baby of the diet of the mother during pregnancy.

Dr. Colebatch, in reply, thanked those present for the reception given to his communication. He said that the mother had had subclinical scurvy, with depletion of the supply of vitamin *C* normally available for the initial requirements of the baby.

Generalized Tuberculosis.

DR. W. E. KING showed a boy, aged five years, suffering from pulmonary tuberculosis, generalized lymphatic adenitis and splenic enlargement. The boy's father was at the time in a sanatorium suffering from pulmonary tuberculosis; the mother, a brother and a sister were believed to be healthy. The patient's present illness had commenced approximately a year before the meeting; at that time the mother had noticed swollen glands in the neck, which had steadily increased in number and size. Previously the boy had had no ill health. At the time of the meeting the illness had been acute for three months; the patient was feverish, very listless and inclined to lie down frequently in the day-time. During the three months he had lost approximately fourteen pounds in weight. At the time of his admission to hospital he was feverish, with a rapid pulse, a cyanotic tinge about the lips and general pallor. The ribs were prominent and the chest wall was thin; movement was restricted on the right side. The percussion note was impaired anteriorly towards the apex and in the right axilla; and vocal fremitus and vocal resonance were increased over those areas. The abdomen was distended and "doughy" on palpation. The spleen was readily palpable and the liver was slightly increased in size. Numerous cervical lymph glands were enlarged, many of them being matted together, though those on the periphery were discrete and not tender or fluctuant; glands in the axillæ and groin were enlarged, discrete and not tender. Skiagrams of the chest revealed an area of consolidation towards the base of the upper lobe of the right lung, with enlargement of the hilar glands; and Dr. King directed attention to appearances which he took to be diffuse mottling indicative of early miliary dissemination of a focus of tuberculous bronchopneumonia. He said that cerebro-spinal fluid obtained by lumbar puncture appeared to be normal; it was clear and contained no cells, and it had been ascertained that the protein content amounted to 15 milligrammes and the chlorides to 721 milligrammes per 100 cubic centimetres. Dr. King also informed the members that acid-fast bacilli had been found in a microscopic preparation obtained directly from the gastric mucus and that on culture of the gastric contents Dr. Reginald Webster had isolated *Bacillus tuberculosis* in two weeks. Dr. Webster had also prepared, from a cervical gland that had been removed from the patient, sections showing the typical histological features of tuberculous lymphatic adenitis. A strongly positive reaction was obtained to the Mantoux skin test with old tuberculin in a strength of 1 in 1,000, and a patch test with tuberculin also produced a positive reaction. The hæmoglobin value was estimated at 90% and the leucocytes numbered 24,000 per cubic millimetre; 50% were polymorphonuclear.

Dr. King remarked that the manifestations he had described were unusual in tuberculous infection in early childhood; it had seemed more likely that the condition was Hodgkin's disease. However, the diagnosis of tuberculosis had been substantiated and he had brought the matter to the notice of those present because he thought they would be interested in an unusual example of tuberculous infection.

DR. H. J. SINN drew attention to the similarity between the illness of the patient shown by Dr. King and that of the baby shown at a previous meeting by Dr. Robert Southby. Dr. Southby's patient had reached the age of two and a half years, and was at the Austin Hospital.

DR. A. M. HUTSON said that Dr. Southby's patient now had the appearance of a healthy infant and was gaining in height and weight; he might have chronic miliary tuberculosis. Dr. Hutson raised a doubt as to whether the appearances in the film were those of tuberculous bronchopneumonia or miliary tuberculosis; he added that, as in the case of Dr. Southby's patient, that feature was open to question.

Dr. Hallam said that he was frankly puzzled as to the condition in the chest; it might be a partial collapse due to enlarged glands; he believed miliary tuberculosis to be present. In a tuberculosis clinic it was not uncommon to find calcified miliary tubercles in the lung. On the other hand, the condition might be extensive tuberculous pneumonia. Probably a tuberculous pneumonic patch was present, or an atelectatic patch due to enlarged glands and, in addition, a miliary spread.

Dr. King, in reply, mentioned that there was another baby at that time in the hospital; and many of those present

could remember another infant with a similar condition. In spite of those four cases in the past two years at the hospital, it remained true that multiple tuberculous glandular enlargements were exceptional in infancy and childhood.

Pathological Specimens.

Tuberculosis.

DR. REGINALD WEBSTER discussed a specimen of tuberculous disease of the spine secured at a recent autopsy. His first acquaintance with the patient, a little girl, aged six years, was in May, 1939, when he had been asked to assist in the elucidation of the nature of an indolent submental ulcer with which the child presented herself at the hospital. The most favoured clinical diagnosis was that of tuberculosis; but attempts to demonstrate tubercle bacilli in the exudate from the ulcer had been unsuccessful.

In July, 1939, a lymphatic gland in the vicinity of the ulcer enlarged and subsequently broke down; from the detritus evacuated from the gland Dr. Webster cultivated the tubercle bacillus. The dysgonic cultural characters of the organism and its high virulence to the rabbit established it as indubitably a bovine strain.

Within a few months the child returned to hospital exhibiting clinical and radiological evidence of tuberculous disease of the spine. She was transferred to the orthopædic section at Frankston, where she died early in August, 1940, of tuberculous meningitis. The autopsy was carried out by Dr. Stella Altmann, who had kindly forwarded the specimen from the spine and a sample of the cerebro-spinal fluid.

Dr. Webster drew attention to the destructive lesion in the body of the first lumbar vertebra, and remarked that his principal interest in the specimen concerned the probability that the bony disease had been occasioned by tuberculous infection of bovine origin. In view of the fact that the bovine bacillus had been recovered from a tuberculous cervical gland in this patient, was it safe to assume that the disease in the spine was also due to bovine infection? Apparently it was, for A. S. Griffith, unchallenged international authority on all matters pertaining to human and bovine tubercle bacilli, had stated that there was among 1,405 cases investigated no instance of the recovery of differing types of tubercle bacilli from a plurality of lesions in the same individual. In other words, a mixed infection with human and bovine types of tubercle bacilli was extremely improbable. Dr. Webster intimated that he did not propose to let the matter rest at argument by analogy, but had prepared appropriate cultures in order to determine the point in this particular instance.

Consideration of this specimen had reminded Dr. Webster of the view held by some that the spinal column was more frequently attacked by the bovine tubercle bacillus than were other bones or joints. Figures which seemed to support this opinion were published by Sir Henry Gauvain in 1925, and a later analysis by A. S. Griffith appeared to supply confirmatory evidence. Griffith found that in children aged under ten years the percentage incidence of bovine infections in tuberculous disease of the spine, hip joint and knee joint was 34·4, 23·9 and 18·0 respectively. However, the statistical evidence by which this conclusion was reached was to be questioned, on the ground that the numbers considered were not sufficiently large to obviate error due to random sampling. The idea that the spine was particularly prone to bovine tuberculous infection was susceptible of the facile explanation that the vertebral bodies were sometimes infected directly from the mesenteric glands (in which the incidence of bovine infection was notoriously high) via lymphatic channels and glands lying in close relation to the anterior aspects of the bodies of the vertebræ.

Dr. Webster said that in view of his experience that among 42 cultures of *Bacillus tuberculosis* which he had recovered from osseous lesions in children he had met no bovine strains, in spite of the fact that spinal disease figured largely as a source of cultures, he was not impressed with the suggestion that spinal tuberculosis was more likely to be of bovine origin than was tuberculous disease of other bones and joints.

Dr. Webster reported the recent occurrence of two instances of cutaneous tuberculosis. The lesions in both children conformed to the clinical description of lupus as distinct from scrofuloderma and *erythema induratum* (Bazin's disease). Both patients were brought to the hospital by reason of the development of fluctuant inguinal swellings, and in both cases Dr. Webster had cultivated *Bacillus tuberculosis* of human type from the product of aspiration of the softened inguinal glands. He indicated that he brought these two examples of cutaneous tuberculosis to the notice of the society on behalf of Dr. Russell Howard, who had detected the skin lesions in a search for infective foci in the lower limb. In one child the lupoid lesions were situated on the skin of the thigh and in the other on the skin of the great toe. Dr. Howard had excised the affected areas of skin in both cases, and microscopic sections of the tissue showed characteristic tuberculous histological appearances.

J. Kamienski, in an article in the issue of *Tubercle* of October, 1939, reported having investigated the bacteriology of lupus in 18 cases of this affection. By guinea-pig inoculation he recovered tubercle bacilli in 16 cases. Ten of the cultures proved to be of human type, one bovine, and in five the type was undetermined.

Bronchiectasis.

Dr. Webster next discussed a specimen from the left lung of a child, which exhibited what he regarded as bronchiectatic cavities throughout the lower lobe. The child, aged two and a half years, had suffered from a cough for three months, with recurrent attacks of fever and dyspnœa. The radiological appearances had been such as to suggest the presence of congenital cystic disease of the lung; but Dr. Webster was not disposed to concur in such a view.

Congenital cysts of the lung might be single or multiple, the former tending to be large, "expansion" or "balloon" cysts, and the latter more commonly small. Both types were of bronchial origin, as indicated by the occurrence in the walls of the cysts of epithelium (variously modified), bronchial mucous glands, muscle, elastic tissue and cartilage. As they occurred in the walls and septa of lung cysts, however, these histological components were scattered and lacked the orderly arrangement in which they appeared in the bronchi. It was with the multiple small cysts that Dr. Webster was chiefly concerned in the consideration of the specimen which he had placed on view.

When infection occurred in multiple small cysts the distinction from bronchiectasis might be very difficult. Cystic disease tended to be more peripheral and less characteristically lobar in distribution than bronchiectasis, and there was generally a striking discrepancy in size between the cysts and the undilated bronchi leading into them. When these criteria were applied to the specimen it would be seen that it conformed in gross anatomy to bronchiectasis rather than to congenital cystic disease of the lung. Microscopic sections had been prepared from the walls of the cavities, but had proved of little assistance, owing to the disintegration of the bronchial wall and the replacement of the normal structures by pyogenic granulation tissue. Columnar ciliated epithelium, however, appeared to be surprisingly well preserved, and it seemed probable that there had been some attempt at renewal of the epithelial lining.

Pertussis Immunization.

DR. DOROTHY GEPP read a paper entitled "Some Aspects of Pertussis Immunization". This paper was published in the issue of November 16, 1940, at page 487.

Correspondence.

A MEDICAL ECONOMIC PROBLEM.

SIR: Statements are made from time to time of the aggregation of wealth in few hands. The facts are very difficult to obtain, but in Victoria the unemployment tax is levied without any exemption and consequently gives a fair picture of the position. The difficulty is emphasized by the fact that in some years farmers receive no income at all.

In 1937-1938 persons receiving £101 to £350 a year numbered 83·6% of the total of those who received taxable incomes, and 92·4% received £101 to £500. For the first time a dissection has been made by the Commissioner of Taxes into income from personal exertion and income from property. Of the total taxable income, £118,636,000 is derived from personal exertion and £19,650,000 from property; 77,900 individuals who received more than £350 included in those incomes 74·3% of the taxable income from property—that is, 16·4% of the payers of tax or 4·2% of the population.

Thus, as in other countries, the vast bulk of personal exertion income is obtained from people with moderate incomes. This fact has long been recognized by the Victorian Bush Nursing Association, and on this fact its policy has been based.

The figures quoted have been obtained through the kindness of the Government statist, Mr. Gawler.

Yours, etc.,

JAMES W. BARRETT.

103-105, Collins Street,
Melbourne, C.1,
November 28, 1940.

AN APPEAL.

SIR: At a recent meeting of the library committee of this hospital it was pointed out that only one number of *The Australian and New Zealand Journal of Surgery* is required to complete the set of this publication.

The number in question is Volume VI, No. 2, October, 1936, and the committee decided to ask if you would be good enough to insert a notification to this effect in your valuable journal with a view to obtaining the missing number as a donation.

It will be greatly appreciated if you can kindly see your way to do this.

Yours, etc.,

C. J. M. WALTERS,
General Medical Superintendent and Chief Executive Officer.

The Prince Henry Hospital,
Little Bay,
Sydney.
December 2, 1940.

UNCOMMON TAPEWORM IN A CHILD (DIPYLIDIUM CANINUM).

SIR: A specimen of some interest was recently submitted for identification by a medical practitioner. It was from a child of seventeen months and was seen by the mother in the stools in the form of "something white and moving, about three-quarters of an inch long". On examination the specimens proved to be mature segments of a tapeworm—*Dipylidium caninum*—a very common parasite of dogs and cats but only rarely occurring in human beings. As a result of treatment with *Filix Mas* as advised for the beef-measle tapeworm, *Tænia saginata*, a complete specimen of the worm was voided.

The life history of the parasite is completed in two hosts—the tapeworm stage in man, with the extrusion of ripe segments containing ova. The ova are themselves voided from the genital pores in the segments and so may soil the skin and hair of the host—dog or cat. The cystic stage of the parasite takes place in the dog flea (or sometimes in the louse), and the dog (original host or another) becomes infected by swallowing an infected flea containing the minute cysts. It was learned that the child from whom this specimen was obtained was in the habit of playing frequently with a pet dog, and there can be little doubt that the child had become infected by swallowing a flea from the dog.

The identification of the parasite is easily made by the shape of the ripe segments of the tapeworm, which are of a long oval or "cucumber" shape, as contrasted with the sharp rectangular shape of *Tænia saginata* or *Tænia solium*.

Infection of man with *Dipylidium caninum* is rare, but well authenticated by some hundred reports in the literature.

Yours, etc.,

HAROLD A. WOODRUFF.

Bacteriology Department,
University of Melbourne,
December 2, 1940.

Notice.

AT the request of the Council of the Victorian Branch of the British Medical Association the result of the ballot for the election of members of the Council and Committee for 1941, together with the votes polled, is published:

1. D. M. Embelton	230
2. John S. Green	229
3. H. C. Colville, Kenneth Smith	228
5. John H. Gowland	224
6. Professor P. MacCallum, D. J. Thomas	222
8. Professor Marshall Allan	220
9. F. Kingsley Norris	219
10. John Dale	216
11. M. O. Kent Hughes, David Roseby	211
13. Charles Byrne	192
14. Leo A. Neal	190
15. Euan I. Littlejohn	178

Two hundred and thirty ballot papers received.

Obituary.

JOHN JOHNSTON.

WE regret to announce the death of Dr. John Johnston, which occurred on November 25, 1940, at Melbourne, Victoria.

JOHN JOSEPH O'NEILL.

WE regret to announce the death of Dr. John Joseph O'Neill, which occurred on December 4, 1940, at Sandringham, Victoria.

FLORENCE CHARLES BURKE-GAFFNEY.

WE regret to announce the death of Dr. Florence Charles Burke-Gaffney, which occurred on December 8, 1940, at Bendigo, Victoria.

Diary for the Month.

JAN. 6.—New South Wales Branch, B.M.A.: Executive and Finance Committee.

JAN. 7.—New South Wales Branch, B.M.A.: Council (Quarterly).

Medical Appointments: Important Notice.

MEDICAL PRACTITIONERS are requested not to apply for any appointment mentioned below without having first communicated with the Honorary Secretary of the Branch concerned, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

New South Wales Branch (Honorary Secretary, 135, Macquarie Street, Sydney): Australian Natives' Association; Ashfield and District United Friendly Societies' Dispensary; Balmain United Friendly Societies' Dispensary; Leichhardt and Petersham United Friendly Societies' Dispensary; Manchester Unity Medical and Dispensing Institute, Oxford Street, Sydney; North Sydney Friendly Societies' Dispensary Limited; People's Prudential Assurance Company Limited; Phœnix Mutual Provident Society.

Victorian Branch (Honorary Secretary, Medical Society Hall, East Melbourne): Associated Medical Services Limited; all Institutes or Medical Dispensaries; Australian Prudential Association, Proprietary, Limited; Federated Mutual Medical Benefit Society; Mutual National Provident Club; National Provident Association; Hospital or other appointments outside Victoria.

Queensland Branch (Honorary Secretary, B.M.A. House, 225, Wickham Terrace, Brisbane, B.17): Brisbane Associated Friendly Societies' Medical Institute; Proserpine District Hospital. Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY HOSPITAL or position outside Australia are advised, in their own interests, to submit a copy of their Agreement to the Council before signing.

South Australian Branch (Honorary Secretary, 178, North Terrace, Adelaide): All Lodge appointments in South Australia; all Contract Practice appointments in South Australia.

Western Australian Branch (Honorary Secretary, 205, Saint George's Terrace, Perth): Wiluna Hospital; all Contract Practice appointments in Western Australia.

Editorial Notices.

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